IDRC
CRDI
CIID

CANADA

ZOONOTIC AND PARASITIC DISEASES

PROCEEDINGS OF THE THIRD
INTERNATIONAL AND PAN-ARAB SEMINAR
HELD IN AMMAN, JORDAN,
17–20 OCTOBER, 1989

The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in six sectors: agriculture, food and nutrition sciences; health sciences; information sciences; social sciences; earth and engineering sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are in Ottawa, Canada. Regional offices are located in Africa, Asia, Latin America, and the Middle East.

Le Centre de recherches pour le développement international, société publique créée en 1970 par une loi du Parlement canadien, a pour mission d'appuyer des recherches visant à adapter la science et la technologie aux besoins des pays en développement; il concentre son activité dans six secteurs : agriculture, alimentation et nutrition; information; santé; sciences sociales; sciences de la terre et du génie et communications. Le CRDI est financé entièrement par le Parlement canadien, mais c'est un Conseil des gouverneurs international qui en détermine l'orientation et les politiques. Établi à Ottawa (Canada), il a des bureaux régionaux en Afrique, en Asie, en Amérique latine et au Moyen-Orient.

El Centro Internacional de Investigaciones para el Desarrollo es una corporación pública creada en 1970 por el Parlamento de Canadá con el objeto de apoyar la investigación destinada a adaptar la ciencia y la tecnología a las necesidades de los países en desarrollo. Su actividad se concentra en seis sectores: ciencias agrícolas, alimentos y nutrición; ciencias de la salud; ciencias de la información; ciencias sociales; ciencias de la tierra e ingeniería; y comunicaciones. El Centro es financiado exclusivamente por el Parlamento de Canadá; sin embargo, sus políticas son trazadas por un Consejo de Gobernadores de carácter internacional. La sede del Centro está en Ottawa, Canadá, y sus oficinas regionales en América Latina, África, Asia y el Medio Oriente.

This series includes meeting documents, internal reports, and preliminary technical documents that may later form the basis of a formal publication. A Manuscript Report is given a small distribution to a highly specialized audience.

La présente série est réservée aux documents issus de colloques, aux rapports internes et aux documents techniques susceptibles d'être publiés plus tard dans une série de publications plus soignées. D'un tirage restreint, le rapport manuscrit est destiné à un public très spécialisé.

Esta serie incluye ponencias de reuniones, informes internos y documentos técnicos que pueden posteriormente conformar la base de una publicación formal. El informe recibe distribución limitada entre una audiencia altamente especializada.

IDRC-MR263e
November 1990

ZOONOTIC AND PARASITIC DISEASES

Proceedings of the Third International and Pan-Arab Seminar held in Amman, Jordan, 17-20 October 1989

Edited by
Oumeish Youssef Oumeish and Panduka M. Wijeyaratne

Cosponsored by
International Development Research Centre,
Ottawa, Canada
and The Higher Council for Science and Technology,
Amman, Jordan

Material contained in this report is produced as submitted and has not been subjected to peer review or editing by IDRC Communications Division staff. Unless otherwise stated, copyright for material in this report is held by the author. Mention of proprietary names does not constitute endorsement of the product and is given only for information.

91-01415/

TABLE OF CONTENTS

1. ZOONOSES; GENERAL

- Environmental and Community Research Issues on the Zoonoses. 1

Pandu Wijeyaratne

- Zoonotic and Parasitic Diseases in the Mediterranean Area. 8

George Papdopoulos

- New Information in Dermatology. 19

Lawrence Charles Parish

- The Changing Pattern of Disease Implications for Epidemiology and Individuals 26

V. Tipton

- Zoonotic Infections in Aids. 32

D.C.W. Mabey

2. LEISHMANIASIS

- Epidemiology of cutaneous Leishmaniasis in Jordan: The Current Situation. 35

Oumeish Youssef Oumeish

- The Presence, Distribution and Seasonal Abundance of Potential Vectors of Cutaneous and Visceral Leishmaniasis in Jordan. 40

S. Kamhawi

- Epidemiology of Cutaneous Leishmaniasis in The West Bank of Jordan. 55

Hisham Arda

- Cutaneous Leishmaniasis in Syria. Geographical Distribution and Clinical Remarks. 59

Mamoon Jallad

- Existence of Leishmania Major in the South of Syria: Causative Agent of Damascus Boll. 65

  A. Khiami

- Cutaneous Leishmaniasis in Aleppo/Syria. 67

  A. Chehade, A. Mouakeh

- Leishmaniasis and Primary Health Care in Tunisia. 73

  R. Ben-Ismail, M.S. Ben Rachid

- Protective Immunity Against Leishmania Donovani in Balb/C Mice. 75

  Suad Z. Jawdat, Nada K. Al-Hussayni, Layla Kh. Rifaat

- Epidemiological Facts on Kala-Azar in Iraq. 85

  Amjad D. Niazi, Suad Z. Jawdat, Layla Kh. Rifaat and Hana S. Ali.

- Treatment of Leishmaniasis 93

  Mohamed Amen

- Histopathological and Immunological Changes in Experimental Leishmaniasis. 101

  Magda Youssef, Laila Abou Samia, Soheir E. Hamam

3. HYDATIDOSIS

- Hydatidosis in Jordan: A Review. 107

  E. Saliba

- Hydatid Disease: A Comparative Study in the Medical City Teaching Hospital After 10 Years. 110

  A.H. Khalili, T.I. Aljeboori, Remm Munir & M. Alsammak

4. BRUCELLOSIS

- Brucellosis in Animals: Control and Preventive Measures in Jordan. 122

  N. Abdul Aziz, F. Schenkel

- Update of the Epidemiology and Diagnosis of Brucellosis in Jordan. 135

  Yahia F. Dajani, Abdel Aziz Masoud

5. **TOXOPLASMOSIS**

- Prevalence of Toxoplasma Antibodies in Iraqi Pregnant Women in Baghdad. 138

  A.D. Niazi, A.R. Omer, T.S. Al-Hadithe and A. Aswad

6. **RABIES**

- Health Systems Research and Rabies Control. 145

  K. de Balogh

- Rabies and Rabies Post-exposure Prophylaxis in Amman Governorate-Jordan. 152

  Fathy Saleh

7. **SCHISTOSMIASIS**

- Study on Heterologous Immunity in Schistosomiasis Using Heterophyid Antigens. 163

  Magda Youssef, Laila M. Boulos and Mervat El-Azzouni

- Resettlement, Schistosomiasis and Research: On Control Effects in Alexandria, Egypt. 171

  Hoda F. Farag

- Community Control of Schistosomiasis in Zimbabwe. 185

  Sk. Chandiwana, P. Taylor, D. Matanhire, G. Mbaya, S. Makoni

8. **RECOMMENDATIONS OF THE SEMINAR** 200

9. **PARTICIPANTS** 201

FOREWORD

Once again the meeting was held in Amman, the capital of the Hashemite Kingdom of Jordan, for the Third International and Pan-Arab Seminar on zoonotic and parasitic diseases. The Second Seminar was held in Amman in 1987, and the first one in 1981.

The main objectives of this Seminar are:

1. To highlight the current status of knowledge on zoonotic diseases in particular, and other important parasitic diseases in general, in the region.
2. To identify future research needs.
3. To strengthen scientific cooperation within the region and with international scientists. This would include exchange visits and collaborative research efforts.
4. To emphasize community-based approaches in the sustained parasitic diseases in general.
5. To follow up on the progress made towards the establishment of a regional reference center of excellence of zoonotic diseases in Amman.

We are greatly indebted to H.R.H. Crown Prince Al-Hassan for his continuing support of these seminars and for his encouragement of scientific and medical activities as well as primary health care in Jordan. These seminars provide a forum for the exchange of views and for presentation of research done in the Arab countries. The papers presented in these seminars represent an enrichment of the knowledge in the field of zoonotic and parasitic diseases and would help to direct the attention and work of those responsible towards more effective prevention and control of these diseases.

We acknowledge and greatly appreciate the efforts of those who prepared and organized this seminar.

President of the Seminar

Dr. Oumeish Youssef Oumeish

ACKNOWLEDGMENT

The executive committee would like to acknowledge the following for their significant contributions to the seminar:

ARAB AND INTERNATIONAL INSTITUTIONS

The Syrian Arab Society of Dermatology
International Development Research Centre (IDRC-Canada)
United Nations Educational, Scientific and Cultural Organization (UNESCO)
The World Health Organization (WHO)
The Welcome Foundation

JORDANIAN MINISTRIES AND INSTITUTIONS

Ministry of Health and Social Development
Ministry of Interior
Ministry of Finance and Customs
Ministry of Information
Ministry of Tourism
Security Forces
National Medical Institution
Royal Jordanian Airlines
The University of Jordan
The Housing Bank
Amman Development Corporation
Abdul-Hamid Shuman Foundation
Jordan Intercontinental Hotel
Center for Educational Development of Health Personnel (C.E.D.), the University of Jordan
Jordan Designer Printing Establishment (JDPE)
Jordan Tourism and Spa Complex Company:
(Zerga-Ma'in Hot Springs)
Jordan Crown Engineering

MEDICAL COMPANIES

Arab Pharmaceutical Manufacturing Co.
Arab Center for Pharmaceuticals and Chemicals
The Arab Drug Store Co.
Arab Company for Veterinary Drug Industries and their Appliance (ARAVET)
The Jordan Drug Store Co. (Jardaneh)
ACDIMA
Al-Hikma Pharmaceutical
Dar Al Dawa
G. M. Khoury Store
A. Halaby Broths. Co.
Ciba-Giegy Services Ltd.
Munir Sukhtian Co.
Orient Drug Store Co.
Al-Amad Pharmacy

ENVIRONMENTAL AND COMMUNITY RESEARCH ISSUES ON THE ZOONOSES

Pandu Wijeyaratne *

The Zoonoses constitute an enormous heterogeneous group of diseases that have been relatively neglected in terms of community based research in the past, although they are of worldwide distribution. As such, the ecology, socio-cultural and economic relationships of many of the diseases remain virtually undocumented, and perhaps also little appreciated.

Also, the complex interrelationship(s) between the animal and human cycles remain largely unclear. The parasite in the animal cycle has been a source of fascination and study, as it has in the human cycle and disease, but the interrelationships and transmission patterns are still obscure, precluding feasible and sustainable prevention and control.

This paper for discussion is attempted with that underlying thought in mind; it is aimed at generating key issues that need to be investigated, and examines some approaches for achieving them.

Firstly, I would like to take Leishmaniasis as an example and consider the whole question of preventive measures aimed at protecting the groups at risk in the community. These approaches have rarely been attempted for several reasons, including:

i) The risk factors of acquiring the infections are not completely identified; i.e., the precise interrelationships between the various cycles - domiciliary, peri-domiciliary, and/or sylvatic.

ii) The use of chemicals such as repellents to impede man vector contact is not feasible.

iii) There is a lack of "appropriate" drugs for community-wide use.

iv) Such measures as bed nets to prevent sandfly attach are unpopular because they decrease ventilation, make conditions hotter and are often very costly.

---

* Dr. Pandu Wijeyaratne, Senior Program Officer, Health Sciences Division, International Development Research Centre (IDRC) Ottawa, Canada

Now let us look at the issue of animal reservoir control.

Although such measures have been attempted on a very limited scale, significant impediments to their success in controlling the disease have been:

i) the lack of complete knowledge of all the reservoir hosts involved;

ii) the reluctance to destroy domestic animals when they constitute reservoirs; and

iii) the lack of economically feasible methods for their control.

It is becoming increasingly apparent that significant cultural aspects and lack of community education about the disease need to be addressed, if animal reservoir control measures are to be practised as viable approaches. Similar cases can be made for many of the other parasitic and non-parasitic zoonoses as well as for Leishmaniases.

I would now like to look at factors associated with development, e.g.:

1) Who are the affected populations?

The parasitic zoonoses predominantly affect poor rural communities who are a largely neglected sector of our populations.

Most sufferers belong to the economically viable age groups of the populations.

Very often, males are more affected, and a strong association with occupational exposure is evident. For instance, in Ethiopia, children (4-14 years) herding livestock show the highest prevalence of CL, acquiring the infection from sandflies infected mainly from the hyrax. In the Ethiopian southwest, the same animal reservoir is the source of infection of VL for coffee-growing adult men.

In the Andean and Amazonian regions of South America where CL and MCL are common, colonization schemes and resettlement, deforestation and cultivation of new land are known to be associated with widespread human infection, which is acquired from various animal reservoirs. People involved in hunting, fishing and gathering activities are the most affected.

In Tunisia, as well as in the Middle East, it appears that large scale construction programs for water resources appear to have increased the prevalence of CL and Dogs and rodents are incriminated as reservoirs.

2) What then are the socio-cultural aspects?

It is evident that the following factors need to be carefully considered in determining socio-cultural aspects relevant to the zoonoses.

i) General demography and educational status of the community, including occupations.

ii) General status of community well being (community diagnosis).

iii) Perception of the community on sources and modes of acquisition of infection and their attitudes towards such modes.

iv) Beliefs and practices about the diseases (this can include considerable surprises).

v) Social and community infrastructural aspects of the population, including occupations and services.

vi) Patterns of behaviour of:

(1) sub-clinical infection carriers,
(2) acute cases, and
(3) chronic cases.

vii) General comprehension about health and disease, prevention and control, and the use of any health facilities. The idea of risk factors in Zoonosis. Social interactions in the community and animal-human associations.

viii) If, as is often the case, there are resettlement schemes, and migrant workers or nomadic populations are involved, then it is important to examine three basic levels, i.e., point of origin, route, and final destination; as well as duration of movements, frequency, etc. Likewise recreation and leisure patterns in the community which may be related to disease transmission, and their impact and effects, would need to be looked at.

ix) Possible influence of "disease" on education attainment, development and motivation of the community are now of ever increasing concern.

x) influence of the "disease" on household activities, e.g., child care, cooking, backyard farming, productivity, etc. would also need to be addressed.

Now let us look at some relevant economic factors that need to be examined in relation to the zoonoses.

i) Sources of income in the community and employment patterns.

ii) Ownership of land and other assets.

iii) Nomadic populations and sources of income/survival and productivity.

iv) Access to resources, e.g., hunting, fishing, gathering.

v) Agricultural patterns in the community, including schemes for mechanization, commercial enterprises, etc.

vi) Colonization and resettlement schemes, forestation and forest clearance activities, irrigation schemes and other development projects in the area.

vii) Local political and economic structure.

viii) Location and distribution of houses and their design.

ix) Domestic animals, livestock and other animals - distribution and practices.

x) Existence of temporary and permanent labour pools.

xi) Individual treatment costs.

xii) Loss of time at school/work/home at different levels of disability/morbidity.

xiii) Associated losses in income/revenue and savings and investment opportunities.

xiv) Hospitalization costs.

xv) Costs of preventive care.

xvi) Costs associated with animal reservoirs and their control or elimination.

xvii) Costs of efforts at disease control in the community.

xviii) Priority given to the zoonoses by:

1) local physicians,
2) the local Health Centres,
3) Ministry of Health,
4) Other relevant authorities, e.g., Agriculture.

Now I would like to address this issue in the general context of "development".

For developing countries, which constitute about 75% of the global population (the "less-developed countries", or the "Third-World"), "development" is the key objective and is usually thought of in terms of planned intervention. Major obstacles in the path of development include many varieties of widespread infectious and parasitic diseases, frequently exacerbated by malnutrition and other health conditions. The zoonoses are typical and important examples.

Disease control, with the intention of producing decreased morbidity, decreased mortality, and general economic development, is considered necessary to improve the "quality of life". The links between disease and poverty, including the idea that people are sick because they are poor and become poorer because they are sick, also appear logical.

If zoonotic diseases such as Neurocysticercosis, Brucellosis, Hydatidosis or Leishmaniasis debilitate the population and eventually deplete the vitality of the labour force, they constitute barriers to progress. Therefore, it is widely held that public health interventions are prerequisites for economic development, implying that poverty can be prevented by disease control. Of course, thought should also be given to possible negative aspects of such interventions.

On the other hand, the consideration of development, developmental projects and macrodevelopmental schemes and their impact on exacerbation of zoonotic diseases are of increasing urgency. Massive internationally funded schemes of various types are now rampant in various part of the tropical world. Water resource development schemes such as large dam construction projects, or projects associated with deforestation or reforestation, as well as migration, resettlement, or road building, usually cause widespread ecological disturbances, and communities are subjected to significant changes in their

biological, physical, or socio-cultural environment. Whatever the specific attributable factors, exacerbation of zoonotic health problems are considered to be by-products.

We have, today, very little knowledge of the precise impact of the developmental projects on parasitic diseases, including the zoonoses. We have an even lesser understanding of the possible mechanisms involved in the effect of these ailments on behaviour or on learning capacity, development and work efficiency. Needed desperately are: more reliable data on prevalence, precise and usable information on vectors and reservoirs in relation to their habitats, and a better understanding of traditions, customs and practices in relation to the disease in the community.

Information to be provided to the relevant ministries and planners in the country should be shown in the context of the communities' needs and demands, along with the essentials for intervention, and the impact on development, both short and long term. Every macrodevelopment project must have a component which considers all factors in relation to relevant zoonoses, and approaches to prevention and control must be identified through reliable research findings. There is a great need for input from the affected communities, with their active involvement and their in-depth understanding for a more effective role in the overall process of intervention. Community participation plays a significant role in sustained health improvement.

Available technology, whether for more sensitive diagnosis, community surveillance or epidemiological methodology, needs to be exploited and applied; costs and benefits are of prime importance. Useful information from various disciplines attacking the problems could be the key to the elimination of these infections as obstacles in the path of development, or could at least minimize their adverse impact on developing communities.

Selected References

1. Acha, Pedro N., and Szyfres, Boris, (1987): Zoonoses and Communicable Diseases Common to Man and Animals; 2nd Edition Scientific Publication No. 503, Pan American Health Organization, Washington, D.C.

2. Brown, P.J., Socioeconomic and Demographic Effects on Malaria Eradication: A Comparison of Sri Lanka and Sardinia, Soc. Sci. Med. Vol 22, No. 8, pp 847-859, 1986.

3. Herrin, A.N. and Rosenfield, L. (1988): Economics, health and Tropical Diseases. University of the Philippines, School of Economics, Manila, Philippines.

4. Walton, B., Wijeyaratne, P.M. and Modabbar, F., (1988) Editors; Research on Control Strategies for the Leishmaniases, IDRC Manuscript Report Series MRS-184e; International Development Research Centre, Ottawa, Canada.

5. World Health Organization (1989). Tropical Diseases. Program in International Research, 1987-1988. World Health Organization, Geneva, Switzerland.

ABSTRACT

on

ZOONOTIC AND PARASITIC DISEASES IN THE MEDITERRANEAN AREA

By Dr. George Papadopoulos

Director, Mediterranean Zoonoses Control Centre

There is a wide range of zoonotic diseases of bacterial, mycotic, parasitic and viral origin which are common to many Mediterranean countries and involve a complex interaction between human and animal populations. Zoonotic infections may cause: deterioration of human health, extended suffering, decrease of productivity, shortening of life span, invalidism and premature death in man. They may also affect animals' health, their productivity, national economies and the world's food supply.

In this working paper are cited the most important zoonotic diseases which have the greatest impact on public health and on the economy of the countries of the Mediterranean area. They are divided according to the etiological agents' position in biological classification. Among the zoonotic diseases of bacterial origin, Brucellosis and Salmonellosis seem to be most prevalent in the countries of the area, followed by Anthrax, Listeriosis and Tularaemia, while Lyme disease, Leptospirosis and Campylobacteriosis are less reported or not well studied. From the zoonotic diseases of parasitic origin, Echinococcosis is the most widespread in the Mediterranean countries, followed by Leishmaniasis, Amoebiasis, Taeniasis, Toxoplasmosis and Trichinosis, while Myiases which have been introduced very recently from the American continent into North Africa may have serious consequences to livestock and probably to man for the countries of the region.

From the zoonotic diseases of viral origin, Rabies remains endemic in some Mediterranean countries, while Rift Valley Fever, though it appeared only in Egypt in 1977, must be continuously under surveillance because of its serious consequences in humans and livestock.

Among the Rickettsial diseases, Boutonneuse Fever and Q-Fiver occur in some Mediterranean and Middle East countries.

The Mediterranean Zoonoses Control Centre, with the collaboration and support of WHO (both Headquarters and Regional Offices), EMRO and EURO and other international organizations, agencies and WHO Collaborating Centres, will make every effort to control and reduce the incidence of the above mentioned zoonoses.

Introduction

Zoonotic diseases have had a tremendous impact on the evolution of man, especially on those cultures and societies that have domesticated and bred animals for food production.

For many years and in many countries, zoonoses and food-borne diseases, with their reservoir in domestic and wild animals, have imposed and are still imposing a very heavy burden, especially among the vast number of people living and working in rural areas. However, the great changes of the last decades, especially the increasing urbanization (not always well-planned or having taken into account the balance of ecological situations), the large movements of populations, the vastly increasing means and speed of transport, and even tourism have contributed to making the problem of zoonoses not only rural and characteristic of well defined areas, but really world-wide.

In many developing and other countries, the conditions with respect to prevalence and socio-economic consequences of zoonoses and food-borne diseases have actually deteriorated in recent years because:

a) changing land-use patterns, farm management and animal industries have led to ecological developments without appropriate controls of their respective health hazards;

b) rapidly developing food industries and changing consumer habits have not been accompanied by adequate services of disease surveillance and control;

c) as developing countries have expanded their animal industries (so much needed for improving the food supply situation and for increasing income through exports), man zoonoses such as brucellosis and hydatidosis have assumed increasing economic significance; and

d) zoonoses associated mostly with domestic and commensal animals in urbanised areas, such as Rabies, Hydatidosis and "newly emerging" zoonoses (e.g., Rift Valley Fever, food-borne diseases, etc.) have become an increased hazard to the growth of the animal population and to the health and well-being of the human population as a consequence of urbanization, travel, tourism and trade.

During this spread, environmental factors (from physical to social ones) have played an important role; and the environment itself has suffered, through the alteration of ecological conditions, as a result of the zoonoses increase. Such an increase certainly contributes to the pollution not only because of the agents and dangerous vectors, but also through many of the control measures such as the wide-spread application of pesticides, with far-reaching consequences in so many biological cycles which negatively affects human health and well-being.

The booklet, "Zoonoses Control", prepared by UNEP/USSR cites:

> "The number of known Zoonotic Diseases is on a constant increase. Many zoonotic and parasitic diseases which for a long time were considered anthroponoses have proved to be "masked" zoonoses. Investigations and research have managed to prove the existence of animals which are natural reservoirs of respective causative agents of diseases and the only reason that these remain unknown is that the pathogens of this group are spread among humans in the absence of their primary animal hosts or that the animal-reservoir cannot be immediately identified e.g. Yellow Fever, Leishmaniasis and others".

Many zoonoses were discovered at a comparatively late period and some of them quite recently. There is reason to believe that growing contacts between man and wild animals in nature, zoos, laboratories or preserves will cause further lengthening of the list of zoonotic infections.

The significance of zoonotic and parasitic diseases in the infection pathology of man can be considered on the basis of individual zoonoses of individual countries. Some zoonoses are "notorious" due to high occurrence of their lethal outcomes (rabies, plague, clostridial infections) and less to their morbidity. Other zoonoses like Salmonellosis, Leptospirosis, Anthrax, and Tapeworm cause mass morbidity and are regarded as most important among human infections. Many zoonoses affect man rarely but doom him to long suffering, ending with invalidism or premature death. Such is Echinococcosis, which is recorded in almost all countries of the Mediterranean area. The rate of infestation varies considerably. Limitation of space requires that the diseases present in different countries of the Mediterranean area can be referred to only briefly.

Zoonotic infections cause various kinds of losses to mankind, the most important of which are the two described below. The first is deterioration of human health, shortening of the life span and decreasing ability to work of zoonoses-affected people. The second kind of loss is associated with diseases of animals which adversely affect their productivity and their important contribution to the world's scarce food supply. Most important in this respect are zoonoses of agricultural animals. The fact that large agricultural animals have provided until now up to 85% of draft power in the world is not yet fully recognized. Zoonoses cause heavy losses of high-quality protein food (meat, fish, etc.) which seems to be increasingly scarce among those populations who mostly need them, particularly children.

The wide range of zoonotic and food-borne diseases of parasitic, bacterial, viral and mycotic origin, common to so many developing countries, makes it almost impossible to develop adequate expertise and specialized services within each individual country. This has been one of the main reasons why major zoonoses such as Rabies, Hydatidosis, Salmonellosis and Brucellosis have as yet not been successfully controlled by national programs.

Modes of Transmission of Zoonotic and Parasitic Diseases

The usual modes of transmission of infection to man are by:

a) Contact, whether direct or indirect (like Foot and Mouth Disease, Anthrax, Brucellosis, Staphylococcosis), Dermatophytosis, arthropod infection (Scabies).

b) Inhalation (Tuberculosis, Q-Fever, Lassa Fever, etc.).

c) Ingestion (Salmonellosis, Shigellosis, Sarcosporidiosis).

d) Vectors such as arthropods or other invertebrates which transmit the infection either mechanically or biologically (Murine Typhus, human Plague, etc.).

e) Inoculation (Leptospirosis, Brucellosis, Q-Fever, etc.).

Zoonotic Diseases in the Countries of the Mediterranean Area

In the following pages we will briefly describe the most important zoonotic and parasitic diseases which have the greatest impact on public health and on the economy of the countries of the area. Prevention and control measures will also be briefly discussed.

I) Bacterial Diseases

a) Anthrax

Active foci in which domestic animals are chiefly involved occur in several Mediterranean countries, particularly in those of North Africa and West Mediterranean.

Prevention and control: Disinfection of animal products, wool and hair; vaccination of animals and high-risk persons; proper disposal of infected carcasses.

b) Brucellosis

The disease is present in all Mediterranean countries and the greatest prevalence in man occurs in those countries which have a high prevalence of Brucella melitensis infection among goats, sheep or both. Camels are also infected, especially when herded with infected animals of other species.

Prevention and control: Test and slaughter (where possible); pasteurization of milk and dairy products; boiling the milk when pasteurization is impossible; vaccination of cattle, sheep and goats. Ultimate control of human Brucellosis rests on elimination of the disease among domestic animals. Immunization of high-risk occupational groups is not performed in the MZCP countries with the exception of France where some trials have been carried out in highly exposed professional groups.

c) Campylobacteriosis

Campylobacter jejuni is considered one of the principle agents causing diarrhea and enteritis in man especially in developed countries. Wild and domestic mammals and birds constitute the large reservoir of this agent. Very few cases are reported from the developed Mediterranean countries.

Prevention and control measures: Pasteurization of milk; hygiene in milk handling; avoiding consumption of untreated water and undercooked chicken.

d) Leptospirosis

The disease has a high prevalence in tropical countries with heavy rainfall and neutral of alkaline soils. In general, outbreaks in man are caused by exposure to water contaminated with urine of infected animals. Occupational groups are particularly at risk. Wild and domesticated animals are essential for the maintenance of pathogenic leptospiras in nature.

Prevention and control: Personal hygiene; rodent control; avoiding swimming in contaminated water.

e) Listeriosis

Listeriosis monocytogenes has long been known to be pathogenic in man and animals. According to the data collected recently, the disease is present in a limited number of Mediterranean countries. Human infection is mostly due to the consumption of contaminated milk, dairy products (notably soft cheeses), contaminated vegetables, etc.

Prevention and control: Pasteurization of milk; rodent control; proper handling of silage.

f) Lyme Disease

The disease is caused by Borrelia burgdorferi and is transmitted by ixodes ricinus. In the European part of the Mediterranean area the infection has been found where looked for. Transmission seems to occur from an infected wild animal to another animal and probably to man through a tick bite.

Prevention and control: Tick-infested areas should be avoided. Tick control in wild animals host where possible should be implemented, but this is almost impossible.

g) Salmonellosis

It is obviously the most prevalent food-borne zoonotic disease in the countries of the Mediterranean area. It is also well known that there is no other zoonosis as complex in its epidemiology and control as salmonellosis. It is associated with intensification of animal husbandry, farming practices, movement of animals, urbanization, tourism, customs and habits, environmental conditions, food harvesting and processing technologies, etc. Unfortunately, in many countries of the Mediterranean region salmonellosis cases that occur may never be attended to by medical personnel and therefore very little is knows, with regard to the epidemiology and surveillance systems. Food of animal origin is the main source of infection but water can serve as a vehicle of Salmonella infection for both man and animals.

Prevention and control: Decontamination of feeding stuffs, food and wastes; hygienic slaughter processes and dressing procedures; rodent control; stray dog control; appropriate legislation for the import export of animal feed and products of animal origin; hygienic measures in restaurants, kitchens, hospitals; examination of food handlers, education of food handlers and consumers by mass media and other means.

h) Tularaemia

Foci of tularaemia, caused by Franciella tularensis, exist in some of the European countries of the Mediterranean area and also in Tunisia and Turkey.

Prevention and control: Rodent and arthropod control; occupational and personal hygiene in high risk areas; avoiding consumption of raw or undercooked meat; live attenuated vaccination of population at risk; education of the public to avoid bites of flies, mosquitos, ticks, etc.

II) Parasitic Diseases

a) Leishmaniasis

a) Visceral leishmaniasis (Leishmania donovani infantum) has a low endemicity in the Mediterranean area although many countries have active foci since a great percentage of dogs are infected. Children up to 10 years of age are mainly infected. The growing number of dogs (kept as companion animals) and the halting of insecticidal antimalarial campaigns have led to an increase of the disease.

b) Cutaneous Leishmaniasis exist along the Mediterranean area but mostly in the southern part of Maghreb countries and in the Middle East. It occurs in three forms: the zoonotic, caused by Leishmania major; the anthroponotic, caused by Leishmania tropica; and the skin lesions, caused by Leishmania donovani.

Prevention control: Control of dogs, including strays and wild canine species, and rodents; insecticide control; personal protective measures.

b) Toxoplasmosis

Although one of the most widespread zoonoses occurs very rarely in the countries of the Mediterranean region, it has recently come into prominence as a serious resuscitated complication of AIDS. Human cases reported in recent years have been associated with consumption of raw or undercooked meat, ingestion of raw goats milk or through oocysts in cat faeces. From the public health and economic standpoint, the important animal species affected are sheep.

Prevention and control: Cooking of meats; avoiding contact with cats and cat faeces. Some countries (e.g. France) have introduced preventative measures such as serologically screening women before or during pregnancy.

c) Amoebiasis

Both forms of infection by Entamoeba histolytic and Entamoeba polecki have been reported to be present in the Mediterranean region. The first is essentially a human parasite that can be transmitted to lower animals and the second parasitizes mainly swine and can be transmitted to man.

Prevention and control: Environmental sanitation; sanitary disposal of human faeces; fly control; education of the public.

d) Echinococcosis/Hydatidosis

This disease continues to have high morbidity rates, to cause much suffering in populations of the Mediterranean area, and to give rise to high economic losses both in the public health sector and the animal production industry. Highest infection rates in man are recorded especially in sheep-raising countries, but camel-raising countries are also highly infected. What greatly contributes to the creation and perpetuation of the disease, especially in the mediterranean region, are the favourable conditions created by man, the existing physical and chemical properties of the parasite, the large number of small, ill-equipped and unsupervised slaughterhouses, illegal slaughtering, the high population of stray dogs, etc. On the basis of estimates, ore than 8,000 human cases appear annually in eight out of twenty countries belonging to the MZCP (Mediterranean Zoonoses Control Programme).

Prevention and control: Prevention of dogs, access to infected animals, offals; dog population control; surveillance of slaughter animals and dogs; personal and environmental sanitation; treatment of dogs; education of the public.

e) Taeniasis and Cysticercosis

Although both species T. saginata and T. solium are distributed throughout the world only in a very few countries of the Mediterranean region are they considered to be endemic, especially T. saginata (Syria, Lebanon, Yugoslavia).

Prevention and control: Thorough cooking of beef and pork meat; avoiding use of sewage effluents for pasture irrigation; meat inspection; education of the public to prevent soil and water contamination with human faeces in rural areas.

f) Trichinosis

With hygiene improvements and regular pork meat inspection the incidence of Trichinella spiralis has been reduced remarkably in the Mediterranean area. However, some outbreaks of human Trichinosis were detected a few years ago in Algeria, and more recently in Egypt among Copts and tourists.

The main reservoirs of T. spiralis is nature are wild carnivores. In sub-Saharan Africa, only a wild cycle is known.

Prevention and control: Adequate heat or cold processing of pork and pork products; cooking of garbage and offal before feeding to swine; education of the public to cook all fresh pork and carnivorous game; rodent control.

g) Myiasis

The most dangerous form of myiasis is caused by the screw-worm flies Cohliomya hominivorax and Chrysomya bezziana. The recent introduction of C. hominivorax from the American continent into North Africa could have serious consequences to livestock, wildlife and possibly human populations in Africa, the Middle East and Southern Europe.

Prevention and control: Treatment of navel stumps of neonatal animals and babies; treatment of infected people and animals; treatment of accidental wounds.

III) Viral Diseases

a) Rabies

Rabies remains endemic in the countries on the northern shore of the Mediterranean Sea from Eastern Italy, and throughout Eastern Europe. A significant role in the spread of rabies in some Mediterranean countries is played by wild animal species (foxes, jackals and wolves) while in other countries dogs and cats are mainly responsible for rabies transmission. Bat rabies has become an increasing problem in maritime areas of countries which were considered free of rabies (e.g. Spain).

Prevention and control: Control of domestic carnivores (registration, vaccination, reduction of dog population density and movement, control of stray dogs; international quarantine regulations; reduction of the density of the main hosts (foxes, etc.); oral vaccination of foxes as promising wildlife. Human pre- and post-exposure treatment with vaccines.

b) Rift Valley Fever (R.V.F.)

The disease is distributed throughout a large part of the African continent. In 1977 an alarming outbreak occurred in Egypt causing the death of about 600 people, while in 1978 there were at least 400 cases. The disease has a heavy impact on livestock productions because of abortions and mortality of productive animals (sheep, cattle, buffaloes).

Virus transmission:

- by arthropod vectors (various species of mosquitoes);
- by direct infection (close contact with live and dead animals); and
- by animal products, (milk and milk products).

Prevention and control: The most effective mechanism for the control of R.V.F. is the immunization of susceptible animals with a potent vaccine. An inactivated vaccine is also available for immunizing man. Environmental measures (improved drainage and effluent water management). Insecticide campaign; control of imported animals.

IV. Rickettsial Disease

a) Boutonneuse Fever

Its etiological agent is Rickettsia conori and the principal nonhuman vertebrate hosts are wild rodents and dogs. It occurs in some Mediterranean and Middle East countries. Most of the cases in the Mediterranean region occur in summer when ticks are most active.

Prevention and control: Tick control on dogs. Tick-infested areas should be avoided. Personal protection.

b) Q-Fever

Its etiological agent is Coxiella burneti. Cattle, sheep, goats, wild animals and ticks are natural reservoirs. It occurs in few Mediterranean countries. Occupational groups are mostly affected.

Prevention and control: An inactivated vaccine for the occupational groups has been developed; pasteurization or boiling milk; destruction of placentas and fetal membranes.

The Mediterranean Zoonoses Control Programme (MZCP) and its coordination centre, the Mediterranean Zoonoses Control Centre, in close collaboration with the Head Quarters of the World Health Organization (WHO) and the WHO Regional Offices, EMRO and EURO, and other international organizations, with the MZCP participating countries, WHO Collaborating Centres and other Participating Institutes is making every possible effort to reduce the incidence of the above-mentioned zoonoses in the Mediterranean area and to fulfill the common goal of "Health for all in the Year 2000".

NEW INFORMATION IN DERMATOLOGY

By Lawrence Charles Parish, M.D.

Clinical Professor of Dermatology
Director, Jefferson Center for International Dermatology
Jefferson Medical College
Thomas Jefferson University
Philadelphia, Pennsylvania

and

Alice Mackow, M.S.

Reference Librarian
Scott Medical Library
Thomas Jefferson University
Piladelphia, Pennsylvania

Write to: Lawrence Charles Parish, M.D., 1819 J.F. Kennedy
Boulevard, Philadelphia, PA 19103
Tel (215) 563-8333. Fax (215) 563-3044

NEW INFORMATION IN DERMATOLOGY

By Lawrence Charles Parish, M.D. and Alice Mackow, M.S.

The main purpose of a scientific meeting is the dissemination of information, whether this be the introduction of new ideas, the revision of older concepts, or the reinforcement of established facts. In any of these groupings, the knowledge is lost if it is not shared with medical colleagues and/or the public at large.[1-6]

Many methods exist for making available these concepts. These involve written, oral, and visual techniques. Some means are rapid and others are much more slow. Congresses, poster exhibits, journal articles, book chapters, review papers, newspaper stories, audio cassettes, and videotapes all can be utilized.

The purpose of this presentation will be an examination of the available means and techniques for disseminating medical information. Particular emphasis will be placed upon those tools related to the specialty of dermatology.

To illustrate these principles, let us assume that a new treatment for leishmaniasis is being presented during this congress. Not only does the therapy reduce morbidity, but a study of the therapy reveals new insights into related molecular biology and vector transmission.

Methodology

The techniques can be arbitrarily divided into hard and soft methods. Hard methods result in a permanent record and primarily involve the printed word. Audio and video tapes can also be used. Opposed to these are the soft methods which involve both informal and formal conversations and temporary illustrations. These temporary ways can lead to more permanent or hard methods.

Hard methods

Immediate

Within the first twenty-four hours of the congress presentation, information can be spread world-wide, provided the appropriate preparations have been made. A press officer for the congress may have received a summary of the presentation or even a copy. A news release has been prepared and is to be circulated. The news media has been contacted. Reporters from the major news service may be attending the meeting of stringers maybe in the audience. The story may be then supplemented by an interview with the presenter.[7]

If the story is important enough, it could appear in the next day's newspaper, on international radio, or even on Cable Television News. During the next several days and weeks, other avenues are available in the lay press. Additional newspaper articles, feature stories in magazines, and highlights on radio or television will continue to spread the information.[8]

Rapid

During the following two to four months, the information can be disseminated to the medical news media. This may take the form of a story in a general medical newspaper such as Medical World News or in the more specialized vehicles such as Skin and Allergy News or Dermatology News.

Some journals, e.g. Journal of the American Medical Association, publish news stories from meetings. Others, e.g. International Journal of Dermatology, print the essence of the meetings in departments entitled Abstracts or Proceedings and Transactions, but there is generally a delay of six to fifteen months due to more cumbersome production schedules.

Moderate

A more permanent record is created by the publication of the advance in a journal. This will be discussed in more detail later. For nearly all periodicals, the message will not appear for at least six months and probably closer to twelve or eighteen months, because of the mechanisms of scientific publications. The paper, if it is ready at the time of the congress, is submitted to the journal's editorial offices. It is then sent to two or three reviewers for their opinions. The criticisms must then be relayed to the authors. Changes are made, and the paper is finally accepted. Then the publisher usually will not be able to print the article for several more months.[9]

An audio cassette may not have as cumbersome a review process but there are delays in arranging for interviews or inserting a topic into a series, such as in Dialogues in Dermatology. The video tape has more technological requirements which an increase the time required. Moreover, a video may need illustrations and photographs to augment the presentation.

A poster exhibit can be prepared in a few days today with the use of computers' remarkable graphic software. The delay in this area is generally related to the timing of the scientific meeting, where it can be presented, and the selection committee who may have other agendas.

Slower

A year to two years usually elapses before a concept appears as a review. Many journals now publish such major undertakings, a concept pioneered in dermatology by the International Journal of Dermatology. Hardbound series, such as Clinics in Dermatology, are based upon collecting and collating new information and making it available the clinician. The very nature of a review or clinic article is slower. The literature must be searched. A decision then is made about the significance of material to be included. Then there are the editorial and publication procedures all of which take time.

Slow

At least two, and up to five years are needed to have the advance appear in a monogram or textbook. Exceptions always occur, but there is a long lead time in obtaining a publisher for a concept in convincing the editor of a textbook that the new treatment can be included in a new project or edition. Production schedules for books are usually longer than for periodicals, and are often subject to delays because there is no regular or monthly deadline.

Soft Methods

Informal

During this meeting, new ideas are already being shared with colleagues. Conversations that occur within the auditorium, verbal exchanges in the halls or in the exhibit area, and possibly telephone calls or telefacsimiles to other cities at this time are some of the ways that concepts are being shared. Such means have been referred to as silent colleges.

A new treatment can be spread rapidly to clinicians through pharmaceutical representatives. the detail man offers one of the best ways of disseminating information in a short period of time.

More Formal

Several days or weeks usually pass before the concepts can become the subject of grand rounds or forums. The information may be spread during the monthly meeting of a dermatology society. More auspicious might be the fortuitous presentation of a patient with the appropriate disease which would then allow for discussion.

The new therapy might become appropriate for a presentation at a congress. This could take the format of a forum, seminar, discussion, or new information. The timing would be dependent upon the scheduling of the convention and the flexibility of the program committee. Depending upon the type of advance publicity and form or program mailed prior to the meeting, the treatment for leishmaniasis might be made known to a wider audience. The congress itself might be listed in a calendar of events or directories that outline significant material to be presented.

The What's New format offers an informal way for material to be presented. By its nature, this method is a capsule presentation of what has happened during the past year or two. It does offer dissemination to a number of colleagues, particularly when What's New is then printed in a s newspaper or recounted in an audio summation of a meeting.

Language

The most important aspect of the selection of the language to be used is the audience. If the new treatment for leishmaniasis is meant only for the physicians and other health workers in a certain area, then the language of the area will not be limited. Should the worker wish the widest dissemination, then English should be used.

This idea may seem obvious and possibly chauvinistic, but English is the language of the scientific community. German, once the language of science, and even French, the language of diplomats, may severely limit the audience.[10] More journals are published in English than in other languages. This does not only include American and British publications but such other journals as the Scandinavian Acta Dermato Venereologica, the German-based Archives of Dermatological Research, and the Japanese-originated Journal of Dermatology. Other journals include English abstracts, so that the reader not conversant with French can glean ideas from Annales de Dermatologie e Venereologie or in Korean from the Korean Journal of Dermatology.

Publication

If the congress presentation is to be published by the organization committee or its agent, the presenter has minimal input into the paper's printing. The publication committee will have selected the format and the direction of the paper.

Although the collection in one place of the congress' proceedings has some merit by creating a source document of the transactions, there are several disadvantages. The publication will not be indexed in Index Medicus nor will Science Citation Index be aware of the paper. Many libraries do not purchase proceedings, whether they are labelled as such or disguised under other titles.

Unless the congress can widely distribute the proceedings, the audience may be limited. This may be compensated for by a leading article in The Lancet or a commentary in the International Journal of Dermatology.

Journals

The selection of the appropriate periodical to publish the advance depends upon the target audience and the limitations of the material to be presented. The new therapy for leishmaniasis would be just as inappropriate in the Journal of Investigative Dermatology as a discussion of the molecular biology involved in vector control would be in Cutis.

The effectiveness of a journal is dependent upon a number of factors. The journal may have a large subscription base, but very few of the 80,000 subscribers of the New England Journal of Medicine would be interested in the subject. Not only is the treatment comparatively unimportant to the predominant reader, American internists, but there is an aversion by Americans to a topic that hints of tropical medicine. The Transactions of the Royal Society of Tropical Medicine might be ideal, but if the group to whom the paper is addressed is the clinical dermatologist, then he might be disenfranchised.

Consideration should then be given to a dermatology journal. The Archives of Dermatology has about 14,000 subscribers but these are dermatologists and non-dermatologists, principally in the United States. The International Journal of Dermatology with almost 10,000 subscribers has a diverse, world-wide audience and could be appropriate. The African Journal of Dermatology might also very well be seen by the target audience, but a more limited one by the very definition of its scope and newness.

Many factors other than circulation and subscriber base determine the effectiveness of a journal. A large number of copies may be distributed either by uncontrolled (paid subscriptions) or controlled (free distribution) means but the readership is important. This is dependent upon how many articles the subscriber reads or scans and how many other people inspect the particular issue. Various other sources are important. Inclusion in Index Medicus is very significant. Of the 18,000 published, only 2,938 are included. This can result in the non-subscriber to a journal not being able to locate the article in a hand search of the monthly or annual volumes or a computer search using Medline or similar software. A journal that is not scanned in one of the several variations of Current Contents may also eliminate potential readers. Significance of the article may later be measured through Science Citation Index as to how often it has been cited. Being recorded in one of these indices may take from three to six months.

Later, the journal article may be selected for inclusion in one of the annuals such as the Year Book of Dermatology. An abstract journal may also find it of interest. Eventually, the new treatment of leishmaniasis may appear in a review article or textbook chapter.

Conclusions

Many methods exist for dissemination medical information. These can include hard methods, such as news stories, journal articles, book chapters, and monographs, and soft methods, such as conversion, seminars, and congress presentations. The means chosen depend in part upon the intended audience and time frame needed.

References

1. Bonair, A., Rosenfield, P., Tenguald, K.: Medical technologies in developing countries: issues of technology development, transfer, diffusion and use, Soc Sci Med 1989; 28: 769-781.

2. Kouris, K., Abdel-Dayem, H.M.: Transfer of medical technology from a developed to a developing country, J. Biomed Engineer 1988; 10: 326-330.

3. Friedlander, J.: Clinician search for information, J Am Soc Informat Sci 1973; 24: 65-69.

4. Davis, W.K.: The difficulty of diffusing innovations, Acad Med 1989; 64: 12-13.

5. Stross, J.K.: Information sources and clinical decisions, J Gen Intern Med 1987; 2: 155-159.

6. Aronson, J.: The discovery of resistance. Historical accounts and scientific careers, Isis 1986; 77: 630-646.

7. Winkler, J.D., Kanouse, D.E., Brodsley, L., et al: Popular press coverage of eight National Institutes of Health consensu development topics, JAMA 1986; 255: 1323-1327.

8. Coleman, J.S, Katz, E., Henzel, H.: Medical Innovation: A diffusion study, Indianapolis, Bobbs-Merrill, 1968: 62-63.

9. Vayssariat, M., Olivier, C.: La francophonie, la littérature médicale et la pathologie vasculaire: Dilemme, ghetto ou espoir, J Malad Vasc 1988; 13: 87-88.

CHANGING PATTERNS OF DISEASE

IMPLICATIONS FOR EPIDEMIOLOGISTS AND INDIVIDUALS

by V. Tipton

Most diseases will fit into one of three categories: communicable, degenerative, or behavioral. Even though there are some flaws in this system for classifying diseases it will satisfy our immediate needs. The top ten causes of death in the days of Shakespeare included cholera, diarrhea of the new born, malaria, smallpox, typhus, and other communicable diseases. Most of these diseases are absent, or if not absent, they do not occur in epidemic form in Western Europe and the United States. They have been replaced by degenerative and behavioral diseases as the primary causes of mortality. Thus, in the past two or three hundred years there has been a dramatic shift from communicable to degenerative and behavioral diseases. The causes of the shift are fairly well known and can be stated briefly as follows:

1. The agricultural and industrial revolutions of the 19th and 20th centuries resulted in a marked increase in the supply of food in the western world. It is well known that infection is not always accompanied by disease, i.e., in a given population there may be more individuals with infection than those with clinical manifestations. Good nutrition is a major factor in preventing infection from becoming disease. It must be noted however, that the effects of the agricultural and industrial revolutions of the 19th and 20th centuries have not reached a large segment of the human family. Sahlins (1974) has estimated that one-third to one-half of the world's population goes to bed hungry. Among these unfortunates the incidence of communicable diseases has remained essentially unchanged.

2. On that portion of the globe affected by the agricultural and industrial revolutions there has been a decrease in the incidence of communicable diseases resulting from better nutrition. In a similar way advances in medical technology and mass education have caused a decrease in infection.

3. The concentration of people in urban centers did nothing to help reduce the incidence of communicable diseases but, quite the contrary, it was a significant factor in an increase in the incidence of degenerative and behavioral diseases because environmental pollution, stress, and occupational hazards rose sharply.

Although the causes of the shift from communicable to degenerative and behavioral diseases are well known, the implications are not as well understood and only now are beginning to appreciate their full dimensions. I will consider them under four major headings: (1) social and economic, (2) legal, (3) moral and ethical, and (4) medical.

1. Social and Economic Implications:

The effects of drug addiction (including tobacco and alcohol) and diseases such as AIDS, on family life are beyond measure. In addition to the breakup of the family, social stigma, and the division of society into opposing groups (smokers versus nonsmokers, homosexuals versus heterosexuals, etc.) there are substantial economic considerations.

An example will illustrate the economic aftermath of drug addiction.

> "In Bangladesh over 405 km^2 of land (100,000 acres) that could produce food are used for tobacco, and respiratory diseases, including much (and increasing) lung cancer, follow. At least equally serious, and probably more urgent, smoking only five cigarettes a day in a poor household may result in 8000 calories less a month (33.5MJ), over 250 calories a day or perhaps 50 per person, a serious deficit in marginal diets." (Cohen, et al., 1983).

It is estimated that there are 1.5 million cases of AIDS in the United States. The average health care cost per AIDS patient is approximately $140,000. The cost of AZT treatment by itself is $8,000 for one year. The economic hardships imposed on certain segments of society are extremely heavy and family ties tend to disintegrate under the weight of such burdens. In addition, millions of dollars will be spent to care for AIDS victims and funds that have been used in the past for treatment and prevention of other diseases will be reduced. It appears that AIDS will have an unprecedented impact on the allocation of funds for research. The impact will be felt far beyond the confines of the United States.

Drug addiction is the cause of most violent crimes in the United States. Alcoholism is a significant factor in fatal accidents and accidents may rank as high as fourth among the causes of death in the United States.

2. Legal Implications:

During the past several years a new body of law has emerged in the United States and additional legal needs are being identified constantly. These laws are enacted for the purpose of:

a. Preventing discrimination in schools and in the workplace.

b. Licensing of new drugs.

c. Insuring confidentiality of laboratory tests.

d. Protection of both the individual and society in matters related to antibody screening.

e. Clarification and modification of existing laws dealing with quarantine measures, reporting requirements, and insurance for victims of diseases such as AIDS.

3. Moral and Ethical Implications:

Classes in bioethics are being taught in many major universities in the United States and centers have been established to consider biological issues with moral and ethical implications. Initially the centers dealt with organ transplants, genetic engineering, in vitro fertilization, artificial insemination, surrogate mothers, etc., but now attention has been directed to the age-old debate concerning the rights of the individual when they are in conflict with the need to protect society from irresponsible individuals. Urinalysis as a condition of employment, suspension of constitutional rights under some conditions, and invasion of privacy are only some of the issues being addressed.

4. Medical Implications:

Pavlovsky's (1966) book, "Natural Nodality of Transmissible Diseases" may be summarized briefly as follows: Every disease has a nest where it is produced and nurtured. It is the role of the epidemiologist to examine the nest and understand its structure and component parts. This understanding is the basis for prevention. The shift from communicable to degenerative and behavioral diseases was accompanied by a change in the structure of the nest that was no less dramatic than the shift from communicable to degenerative and behavioral diseases. the one germ - one disease concept was a solid stepping stone to prevention in the past but the etiology of degenerative and behavioral diseases is multi-factorial and extremely complex. As in the past, the epidemiologist must examine the environments of the family, school, and workplace, must be sensitive to attitudes and moral values, and must understand the changing political climate. These attitudes and sensitivities are not new but degenerative and behavioral diseases require an increase in emphasis.

Traditional measures for prevention of disease consist of protection of the individual and alteration of the environment. Individual protective measures include immunization, use of prophylactic and suppressive drugs, personal hygiene, protective clothing, etc. Environmental measures include drainage of swamps, water and sewage treatment, vector and reservoir control, etc. These measures, as effective as they may be for communicable diseases, would have little or no effect on degenerative and behavioral diseases. Prevention of theses diseases is far more complex because it requires a major shift attitudes, perspective, values, and a realization that the life style and behaviour of the individual has an impact on the entire community. In the past we have relied heavily on technology for the control of communicable diseases. Technology alone will not be sufficient for the control of degenerative and behavioral diseases.

Probability concepts, based on mathematical models, have become an important part of prevention strategies. It is easier to construct mathematical models for communicable diseases because there are fewer hidden variables than with degenerative and behavioral diseases.

Summary and Conclusions

A legitimate question may have occurred to some of you: What has this to do with us? We are far removed from Western Europe and the United States and furthermore, the focus of this conference is on parasitic and zoonotic diseases. Over 250 million people travel from one country to another each year. With that kind of mass movement we can say with some justification that we are one community. We must contribute to a common bank of knowledge and draw from the bank as well. AIDS, an exceptional disease because it is communicable, it is degenerative, and it is behavioral, is a grave threat to all the world. It is impossible to predict the impact AIDS will have on mortality rate caused by parasitic and zoonotic diseases. Lyme disease, a zoonotic disease, is now the most prevalent vector-borne disease in temperate areas of the world. Are there other agents of disease awaiting the opportunity to make the transition from lower animal reservoir to man?

Finally, I will suggest four steps that I consider to be essential if we are to curb the spread of degenerative and behavioral diseases.

1. We must recognize the roles of women as primary agents of health as well as primary agents of change. They are the framers of attitudes and the teachers of moral values. In western societies women are moving out of these traditional roles as they enter the work force in ever increasing numbers. It is important that their roles be expanded, not diminished. Women must attain an educational level that will allow them to function properly in the prevention of disease. Parenthetically, earlier i this conference, Dr. Niazi (see page) presented some data germane to the role of women in the prevention of disease. In a study of 247 children with Kala Azar, 70% of the mothers of those children were illiterate while 30% of the fathers were illiterate.

2. Women can teach moral values and individual responsibility and shape attitudes but these teachings must be reinforced in the schools. The curriculum must include concepts that are biologically sound and that will demonstrate that there are physical and emotional consequences for every choice. Children must realize early in life that a choice of life style is a choice of life relatively free of disease or a life relatively free of health.

3. In primitive societies there is deep belief that each individual has an obligation to preserve society at all costs. The modern welfare society has chartered a course away from that view and now there is constant pressure on society to meet the needs of the individual. This relationship between the individual and society must be brought into balance. The almost forgotten idea that the individual has a moral responsibility to society must be brought to the fore again. At the same time society must determine what kind of society it will be and who will bear the economic, emotional, and social burdens entailed. There is no prophylactic measure that can match the importance of a social conscience in the prevention of degenerative and behavioral diseases.

4. In western societies the major portion of funds expended for health care is invested in treatment facilities and relatively little is spent on prevention. The challenge posed by degenerative and behavioral diseases requires an emphasis on prevention with a strong focus on education.

The German philosopher, Goethe, observed that "Man is a permanent adolescent." A world in which agents of disease flourish is no place for adolescents. The world in which we live demands a maturity that includes social imagination, individual responsibility, independence, and knowledge. A society composed of mature people will respond appropriately to problems of disease and in doing so will reveal its deepest cultural, social and moral values. In our world we need the benefits of technology but we need the values associated with maturity even more.

References

1. Cohen, N., Measharn, A.R. and Akbar, J. 1983. Smoking and respiratory disease symptoms in rural Bangladesh. Public Health (London) 97: 338-346.

2. Pavlovsky, E.N. 1966 Natural Nodality of Transmissible Diseases with Special Reference to Landscape Epidemiology of Zooanthroponoses. University of Illinois Press. Urbana and London. 257 pages. (Translated by Frederick K. Plous, Jr. and the English translation edited by Norman D. Levine).

3. Sahlins, M. 1974. Stone Age Economics. Tavestock Publications Ltd.

ZOONOTIC INFECTIONS IN AIDS

by D.C. Mabey

Senior Lecturer, Department of Clinical Sciences,

London School of Hygiene and

Tropical Medicine

Zoonotic infections responsible for major morbidity and mortality among AIDS patients include toxoplasmosis, which has already been discussed, cryptosporidiosis, salmonellosis, leishmaniasis and cryptococcosis.

Cryptosporidiosis

Cryptosporidium is a coccidian parasite which infects a wide range of organisms, including mammals, birds, reptiles and fish. It was first described in 1907 in asymptomatic laboratory mice. In 1955 it was recognized as a cause of diarrhoea in young animals, principally calves. The first human infection was described in 1976, and between 1976 and 1981 a further 6 cases were described. In 1981-2, 47 cases were reported to the Centre of Disease Control, Atlanta, mostly in association with the newly described acquired immunodeficiency syndrome (AIDS). An association between diarrhoea due to cryptosporidium and immunodeficiency was soon recognized; it was found to complicate both AIDS and hypogammaglobulinaemia.

The life cycle of cryptosporidium is similar to that of other coccidians, with the important difference that the entire cycle can be completed within a single host. This may account for the persistent nature of cryptosporidial infections.

Epidemiology: Although transmission of infection from animal to man undoubtedly occurs, person-to-person transmission is probably more common and several water-borne outbreaks have recently been described.

Pathogenesis: In AIDS patients, cryptosporidium has been found throughout the gut from the pharynx to the rectum. It has also been found on occasion in the bronchi and gall bladder, but the significance of this is not clear at present. The infection is confined to the microvillus border, and appears not to be invasive.

In view of the profuse watery diarrhoea characteristic of cryptosporidiosis, it has been postulated that an enterotoxin may be produced by the organism. No such toxin has been identified, however. The most characteristic pathological finding in AIDS patients with cryptosporidiosis is blunting of the small intestinal villi, crypt hyperplasia and lymphocytic infiltration of the lamina propria, as seen in giardiasis. The mechanism responsible for these changes has not been elucidated, but they may account for the malabsorption frequently seen in persistent cryptosporidiosis.

Diagnosis: Cryptosporidial infection can be diagnosed relatively simply by using the modified Ziehl-Nielsen stain on faecal specimens. This technique appears sensitive, and concentration of the specimen is not generally necessary.

The treatment of cryptosporidiosis in AIDS patients is difficult. Some success has been claimed with spiramycin 1.5-3g daily for 3 to 4 weeks. Such regimes have led to clinical improvement in 60-70% of patients, with eradication of the organism form the stool in up to 30%. Relapses are common, however (up to 50% at 3 months).

Leishmaniasis

There have been at least 30 cases of visceral leishmaniasis reported in HIV infected subjects, mostly from Spain, France and Italy. Unusual presentations include gastric ulceration and a rectal tumour. In the latter case the infection may have been acquired through sexual contact.

I am going to describe a case seen at the Hospital for Tropical Diseases, London, which illustrates some of the more prominent features of visceral leishmaniasis in HIV infected individuals.

The patient was a 35 year old English bisexual male. He had travelled extensively in Europe, South America, India, and Turkey. He was found to be HIV positive in 1986, and after this while in Greece noted a painful ulcer on the anterior aspect of his chest wall, which healed spontaneously.

In 1987, he presented with 3 violaceous skin lesions on his legs. Biopsy of one of these revealed the typical appearance of Kaposi's sarcoma, but also the presence of numerous amastigotes of Leishmania, subsequently shown by isoenzyme typing to be *L. infantum*. Although the patient had no systemic symptoms at this time, a bone marrow specimen and slit skin smears from the back and knees all contained numerous amastigotes. This suggests that many of the clinical features of visceral leishmaniasis, e.g., fever, weight loss and anaemia, may be due to the host response rather than to a direct effect of the parasite. Leishmanial serology was negative, as has been reported in other HIV infected subjects with leishmaniasis, implying that this is not a useful diagnostic test in HIV infected subjects.

A recurring theme in many of the case reports of viscera leishmaniasis in AIDS has been the poor response to treatment. It appears, however, that many of the cases reported have not been adequately treated. The treatment given to this patient was that recommended by Dr. A. Bryceson for children with visceral leishmaniasis in Kenya, that is, sodium stibogluconate 20 mg/kg/day to a maximum of 850 mg, plus allopurinol 20 mg/kg/day in three divided doses. The response to treatment was monitored by weekly splenic aspiration, and treatment was continued for 4 weeks after parasitological cure. The patient remained asymptomatic on this regime and parasitological cure was achieved.

Salmonellosis

The incidence of invasive salmonella infections due to non-typhoid salmonella species is increased in HIV infected subjects. In San Francisco, the incidence of salmonella infection is 20 times higher in AIDS patients than in controls. About half the AIDS patients presented with a febrile illness in the absence of diarrhoea. Salmonella infections are often recurrent in AIDS patients and long term suppressive therapy may be necessary.

In developing countries, where salmonella infection is prevalent, recent studies suggest that invasive salmonella infection is a common cause of death in HIV infected individuals and often occurs before clinical manifestations of AIDS become apparent.

EPIDEMIOLOGY OF CUTANEOUS LEISHMANIASIS IN JORDAN

THE CURRENT SITUATION

Oumeish Youssef Oumeish,

The Jordanian Dermatological and Venereological Society,

Amman - Jordan

Cutaneous leishmaniasis has been reported to exist as an endemic disease in the region of the Jordan Valley since early in the century, and up to the late sixties the cases reported were few and sporatid. The first record of the disease was by Huntemuller[1] who described the first parasitologically proven cases in 1914. Naggan et al[2] described in 1920 the endemicity of Jericho Valley with proven cases, and in 1925 Alder and Theodor[3] identified the causative agent and vector. An early study of the control of the vector Phlebotomus Papatasi was also carried out (Hertig and Fisher, 1945).[4] The zoonotic nature of the disease was first indicated by isolation of Leishmania major from the sand-rat Psammomys obesus (Gunders et al., 1968).[5]

The World Health Statistics Report of 1968 listed only 33 cases of cutaneous leishmaniasis occurring in East Jordan during the period 1939-1948.[6]

In the early 1960s only sporadic cases occurred in East Bank, of Jordan, mainly in a strip of lowland 15 km wide that extends 110 km along the Jordan River, and mainly in a area called Sweimeh.

The endemicity of the disease in East Jordan was only ascertained for the first time in 1981 by Oumeish, Saliba and Allawi.[7] The Major fly Phlebotomus Papatasi was identified as the main vector, and its species was determined by Dr. D.J. Lewis of the British Museum - Natural History, when 731 cases were reported during the period from 1973 to 1981. The cases occurred sporadically in many parts of the country especially in the Jordan Valley, and the majority of the lesions described where of the dry type.

The disease became more significant later on when more than 2,000 cases reported to occur between 1973 and 1983 in several parts of Jordan with almost half of these cases occurring in the Jordan River Valley. The disease also attained epidemic forms where more than 300 acres were reported to occur in eight villages of Mowaqqar Nahia (Sahab District) some 15 km. East of Amman on the outskirts of the East Jordanian desert, this happened between December 1982, and April 1983. Approximately 67% of the cases were below 15 years of age and the lesions seen were on the dry type.

The sand jird, Psammomys obesus, the potential animal reservoir and vector of the disease respectively, were found in the affected area, Leishmania amastigotes were seen in smears from ears of jirds collected from the area suggesting the zoonotic nature of the disease there.

Cases reported later on were 1,100 between 1983-1986 , 180 in 1987, 305 in 1988, 250 in 1989, and 200 cases in 1990.

Imported cases were in the average of 2%, and come from the following countries. Iraq, Sudan, Saudi-Arabia, Somalia, Lebanon, Syria and Palestine.

The factors that have contributed to the increase in the number of cases are many including:

1. The recent considerable rehousing and construction of new houses in the endemic areas.
2. Development of previously uninhabited areas where the reservoir and vector were present.
3. Environmental and ecological changes that favoured an increase in the populations of both the animal reservoirs and the insect vector.

The significant decline in the number of cases observed in the last three years is undoubtedly due to:

1. Measures taken by the Ministry of Health in vector control in the form of spraying.
2. Improvement of health facilities in the affected areas.
3. Availability of medications to treat the patients.
4. Significant progress in understanding the epidemiology of the disease.

Ecological Causes of New Foci

1. Human factors
    a. The affected group are usually close to the natural foci of the disease where the habitat is present for both the vector and the host, the burrows of reservoirs, and it provides shade and humidity for the vector.

    b. Mobilization of infected people from endemic areas into new areas with vectors and hosts.

2. Vector factors include mainly:

    a. Relaxation in spraying of insecticides.

    b. Abnormal fluctuations in vector populations.

    c. Favourable weather conditions both temperature and humidity which are present in the endemic areas.

3. Reservoir host factors include:

    a. Abnormal fluctuations in rodent populations.

    b. Dry season followed by rainfall one causing cracked dry soils to become waterlogged which is ideal for breeding of flies and movement.

Conclusion

Cutaneous leishmaniasis is considered as an important public health problem in the Arab world and in Jordan, and it continues to be a diagnostic and therapeutic problem and relatively neglected in terms of control and research. Although the disease receded in many places due to antimalarial measures, yet new foci appeared as new endemic areas or erupting epidemic forms, but there is lack of detailed information on the prevalence and the limits of the foci. The disease is often not reported and the reported cases are always underestimated.

Leishmaniasis is a good example for the study and control of other zoonoses, where emphasis is concentrated on the vector, reservoir and humans, and dealing with this disease we only treat the patient and neglect to search on the biology and control of both the vector and host.

So the main important conclusions about the disease are:

1. The epidemiological factors are almost similar all around the Arab world.
2. The disease is on the new foci.
3. Appearing in new foci.
4. Health institutions are being more involved with the disease.

5. The disease affects different developmental aspects in the Arab world.

However, further work is needed to:

1. Understand the distribution, ecology, and population dynamics of the animal reservoirs and the sandfly vectors.

2. To apply preventive control control programme.

3. To consider vaccination as a realistic strategy.

Research along these lines should be encouraged and both seminars and workshops.

References

1. Huntemuller, Neuartige Parasitenbefunde bie der Jerichobeule. Zentralblatt fur Bakteriologie, Parasitenkunde und Infektionkrankheiten, 73, 137-141, 1914.

2. Naggan, L., Gunders, A.E., Dizian, R., Dannon, Y., Shibolet, S., Ronen, A., Schneeweiss, R. and Michaeli, D. Ecology and attempted control of cutaneous leishmaniasis around Jericho in the Jordan Valley. Journal of Infectious Diseases, 121, 427-432, 1970.

3. Adler, S. and Theodor, O. The transmission of Leishmania tropica from artificially infected sandflies to man. Annals of Tropical Medicine and Parasitology, 21, 89-110, 1927.

4. Hertig, M. and Fisher, R.A. Control of sandflies with DDT: Bulletin of the United States Army Medical Department, No. 88, 1945.

5. Gunders, A.E., Lidror, R., Montilio, B. and Amitai, P. Isolation of Leishmania sp. from Psammomys obesus in Judea. Transaction of the Royal Society of Trochal medicine and Hygiene, 62, 465, 1968.

6. World Health Organization: WHO Regional Committee for the Eastern Mediterranean third session, 1950, on Leishmaniasis 1939-1948, mimeograph RC3/EM/114. World Health statistics Report 21, 1968.

7. Oumeish Y.O., Elias, K.S., Thabet, F.A. Cutanous leishmaniasis an endemic disease in Jordan, Jordan Medical Journal, 16, 1, 55-61, 1982.

8. Elias, K.S., Oumeish, Y.O., Jalak H., Zuhair, A., Ashford, R.W. Cutaneous Leishmaniasis in Mowaqqar area, Amman Governorate, Jordan, Annals of, Tropical Medicine and parasitology, 79, 2, 139-146, 1985.

THE THIRD PAN ARAB SEMINAR ON LEISHMANIASIS AND OTHER ZOONOSES

THE PRESENCE, DISTRIBUTION AND SEASONAL ABUNDANCE OF POTENTIAL VECTORS OF CUTANEOUS AND VISCERAL LEISHMANIASES IN JORDAN

by S. Kamhawi

Department of Biological Sciences,

University of Salford, Salford, England

Introduction

The increasing incidence of cutaneous leishmaniasis in Jordan over the last two decades and the occurrence of outbreaks in many parts of the country (Oumeish _et._ _al._, 1982; Saliba _et._ _al._, 1985) have drawn attention to the disease as one of the public health importance.

The information available on the presence and true incidence of visceral leishmaniasis in Jordan is scarce even though sporadic endogenous cases of the Mediterranean type occur every year. Recently, both cutaneous and visceral leishmaniasis were made notifiable diseases in Jordan (Qubain, 1989).

Psammomys _obesus_ has been identified as the reservoir and _Leishmania_ _major_ as the causative agent of cutaneous leishmaniasis in the country (Saliba _et._ _al._, 1987). However, the sandfly vector(s) has yet to be determined. Some twenty-one species of sandflies are reported from Jordan to date (Kamhawi _et._ _al._, unpublished). Although eight of eleven _Phlebotomus_ species collected have been incriminated or suspected of being vectors of leishmaniasis, elsewhere only four, _Phlebotomus_ _papatasi_, _P._ _sergenti_, _P._ _major_ and _P._ _perfiliewi_ are thought to be potential vectors of cutaneous and visceral leishmaniasis in Jordan because of their abundance and endophily.

Objectives

This paper provides information on the seasonal fluctuations of _Phlebotomus_ _papatasi_, _P._ _sergenti_ and _P._ _major_ in Swaima, El-Hemmah, the Amman area and the Ajlun Mountains. The significance of the relative abundance of _P._ _perfiliewi_ in an indoor collection on the outskirts of Ibrid and the epidemiological significance of the presence and behaviour of these sandfly species in Jordan is discussed.

Methodology

From July to December 1986 field trips were made throughout Jordan to thoroughly sample the sandfly population. This survey was purely qualitative; no attempt was made to standardize the number of trips, sites and traps used each month. The type of traps used included a CDC light-trap, aspirators, chemical light-sticks and sticky papers.

Quantitative sampling began in 1987 and 1988 when a set number of sticky traps, each made of an A4 sheet of paper (21 cm x 30 cm) was used. The traps were distributed in representative rural and domestic habitats in each area and sampled once a month. Each trip consisted of 2 consecutive days of sampling where a set of 70 traps, oiled with castor oil, was installed and replaced after each morning.

Selection of Sites and Results

In Palestine cutaneous leishmaniasis was found to be hyperendemic in the lower Jordan Valley and around the northern parts of the Dead Sea; P. papatasi and P. obesus were incriminated as the vector and principal reservoir species respectively (Naggan et. al., 1970; Schlein et. al., 1982). In Jordan, more than half of the cutaneous leishmaniasis cases reported during 1973-1978 came from the Jordan Valley region (Ouemeish et. al., 1982) and a village from the valley, Swaima, from the warm desert zone, was chosen as the first collection site.

The small village is situated 1 km north east of the Dead Sea and about 16 km south east of Jericho (Fig 1). During the preliminary investigations in 1986, P. papatasi was found to be the only abundant Phlebotomus species in Swaima which seemed ideal for the study of the seasonal fluctuation of this species. This was monitored from January to December 1987 (Fig 2b). The results of the 1986 collections (Fig 2a) should not be directly compared to those of 1987 but were included to show the abundance of P. papatasi in the domestic as well as rural habitats. In 1986 the maximum number of P. papatasi was collected in August when the species was more abundant in the domestic habitats (258 specimens) than in the rural ones (20 specimens) (Fig 2a).

In contrast, during the standardized quantitative seasonality study in 1987, the peak number of sandflies occurred in October when 143 sandflies, the majority from the rural habitats, were collected (Fig 2b). From April to August 1987 more flies were collected from the domestic habitats than later on in the year, the maximum number being collected in May (61 specimens). These trends are probably caused by changes in the weather. Although the temperature is the same in May and October, at around 27°C (Fig

6a), the relative humidity is much lower in May. The dry weather in May and the relatively hot weather which occurs from June to September (Fig 6a) may cause most of the sandflies to rest indoors where the temperature is lower and the relative humidity higher than it is in the rural habitats.

The second site studied, El-Hemmah, is situated on the northern border of Jordan in the warm steppe zone (Fig 1) at low altitude (ca 75 cm below sea level). P. papatasi and P. major were the most abundant Phlebotomus species collected from the area. To our knowledge the presence of P. major in large numbers at this altitude has never been reported previously, P. major being usually considered a highland species. This observation and the opportunity to compare the season of P. papatasi in Swaima, which belongs to the warm desert zone, with that at El-Hamman made the latter an interesting site for the study of the seasonal fluctuation of P. papatasi and P. major in 1987 and 1988 (Fig 3). P. major seems to exhibit a bimodal behaviour in this area with an initial peak in May, better defined in 1988 than 1987, and a late one in November (Fig 3a-b). The number of specimens collected from the domestic habitats was larger in May and lower in November compared to the rural habitats. In May the temperature was higher and the relative humidity lower than in November (Fig 6b).

The behaviour of P. papatasi in El-Hemmah seems to be highly endophilic in nature (Fig 3c-d). The peak of the P. papatasi season is late in the year, around October and November. This is similar in timing to the peak in Swaima. However, the El-Hemmah population is predominantly domestic which may indicate the unsuitability of the rural habitats of El-Hemmah for the species.

The third site, in the Amman area, is situated in the cool steppe zone (Fig 1) and was affected by a recent outbreak of cutaneous leishmaniasis (Saliba et. al., 1985). A thorough insecticide spraying campaign of the area was carried out approximately three months before the initial sampling began in 1986. This resulted in poor collections throughout that year. The occurrence of the outbreak, the relative abundance of P. sergenti as well as P. papatasi and the opportunity to follow the rate of recovery, if any, of the sandfly population in the area made the Amman area a suitable study site.

Fig 4 a-c shows the seasonal fluctuation of P. papatasi and P. sergenti during 1987 and 1988. For both species in both years the peak of the season seems to be around August and September and both seem to be predominantly endophilic in their behaviour. As in El-Hemmah, the collection of both species in May 1988 was larger than in 1987.

There is a marked increase in sandfly numbers in 1987 and 1988 from the 1987 collections which produced only 9 P. papatasi and 16 P. sergenti in total from July to December. This indicates that the population is recovering rapidly from the spraying campaign which should therefore be maintained at the same intensity if control of the sandfly population is to be achieved.

The peak of the P. papatasi season seems to be earlier in the Amman area than it is in the Swaima and El-Hemmah, both of which belong to warm zones in the climatic regions of Koppen (Fig 1).

A site in the Ajlun Mountains was chosen to represent the cool Mediterranean zone (Fig 1). All the Phlebotomus species here, including P. papatasi and the most abundant species, P. major, came mostly from domestic habitats, i.e., they were highly endophilic (Figs 5a-c). The peak of the season for both species seems to be around August and September. This is similar to the peak of the season in the Amman area, also located in the cool zones but earlier than in Swaima and El-Hemmah in the warm zones. Again P. major seemed to exhibit a bimodal pattern of behaviour in 1988 (Fig 5b) with an initial peak in May preceding the peak in August. The 1988 collections again seem higher than those in 1987 although the monthly variation in temperatures were similar in both years (Fig 6c). However, the relative humidity was higher in 1988, particularly in August, perhaps permitting an increase in the sandfly population size and/or sandfly movement so that more were caught.

A pilot project aimed at assessing the effect of urbanization on the sandfly population of an area was carried out in June and July of 1988 in Irbid. Trapping indicated the relative abundance of P. perfiliewi in the area. Moreover, in August, an overnight indoor collection from a villa situated on the outskirts of Irbid indicated that Phlebotomus perfiliewi was present in relatively large numbers, mostly females (Table 1). The inhabitants of the villa complained of sandfly bites which were initially presumed to be due to P. papatasi. P. perfiliewi is clearly abundant and endophilic in Irbid.

Commentary on the Results

Ecological

The seasonal fluctuation of P. papatasi was monitored and compared at four ecologically distinct sites. Swaima, El-Hemmah, the Amman area and Ajlun Mountains. In Swaima and El-Hemmah, the sandfly season was found to be longer, with the peak late in the season around October and November. In the cooler Amman and Ajlun areas in the season is short, ending in October and peaking earlier in August or September. The optimum climatic conditions for P.

Table 1. The relative Abundance and Endophilic Behaviour of Phlebotomus perfiliewi in Irbid.

	Sandfly species							
Collections 1988	PE		JA		O		SA	
	M	F	M	F	M	F	M	F
June Construction	12	-	6	9	8	4	1324	1440
July Construction	46	2	5	6	6	-	151	422
August Indoors	6	34 (1)	-	-	-	-	32	171

KEY:

PE = Phlebotomus perfiliewi
JA = P. jacusieli
O = Other Phlebotomus species
SA = Sergentomya antennata
M = Males
F = Females
() = Bloodfed females

papatasi in Jordan seem to be a temperature in the low to mid-twenties (°C) and a relative humidity in the high fifties or low sixties (%RH).

The P. papatasi populations of El-Hemmah and Ajlun were virtually restricted to the domestic habitats. In contrast, in Swaima and the Amman area which are dry desert sites which many active rodent burrows and scattered plants of the Chenopodiaceae, many more P. papatasi were caught in the rural habitats. El-Hemmah is a wet, lush, agricultural area with date and banana plantations and Ajlun Mountains are covered with evergreen Quercus forests. In Jordan, P. papatasi seems unable to establish itself in wet habitats with lush vegetation but flourishes in dry desert biotopes.

The relative abundance of P. sergenti in the Amman area and the absence form Swaima probably indicate the intolerance of this species to high temperatures since the relative humidity and rural nature of both regions are similar (Swaima is relatively hotter than the Amman area (Fig 6a & c)).

P. major is usually reported from high altitude mountainous and rocky areas (Butticker & Lewis, 1983; Lane et. al., 1988). However, it was found to be relatively abundant in El-Hemmah (ca 75 m below sea level) as well as in its typical habitat in the Ajlun Mountains (ca 760 m above sea level). Altitude, therefore, does not seem to play a major role in restricting the spatial distribution of this species.

The bimodal behaviour pattern of P. major in both El-Hemmah and the Ajlun Mountains may be an indication of a wide tolerance of climatic variation. The season was shorter in the Ajlun Mountains than in El-Hemmah. It ended in October with a peak in August or September in the former while lasting until December with a peak in November in the latter.

Epidemiological

The distribution of P. papatasi in Jordan seems to correspond to that of cutaneous leishmaniasis. The species was found to be abundant in Swaima and the Amman area, both regions in which the disease has been reported by Oumeish et. al. (1982) and Saliba et. al. (1985) who considered P. papatasi to be the primary vector of cutaneous leishmaniasis in Jordan.

The fact that P. papatasi is a proven vector of cutaneous leishmaniasis in surrounding countries such as occupied Palestine (Schlein et. al., 1982) and Saudi Arabia (Killick-Kendrick et. al., 1985), that it is abundant in the endemic areas of Jordan and that it has been shown to be endophilic in its behaviour seems to support this hypothesis. However, it remains essential to find Leishmania-infected specimens in the field and to assess the rate of infection in each biotope.

P. sergenti was found to be abundant in the Amman area from where an outbreak of cutaneous leishmaniasis occurred in 1982-1983 (Saliba et. al., 1985). Although P. sergenti is usually collected in small numbers (Butticker & Lewis 1983; Dedet et. al., 1984) it may and must be considered as a possible vector of cutaneous leishmaniasis in Jordan. Lane et. al. (1988) commented on the possibility of this species transmitting Leishmania major as well as being the proven vector of L. tropica (Le-Blancq & Peters, 1986; Al-Zahrani et. al., 1988).

P. major is considered the principal vector of visceral leishmaniasis in the Mediterranean basin (Peters & Killick-Kendrick, 1987), it is the proven vector of canine visceral leishmaniasis in occupied Palestine and the suspected one in Saudi Arabia and Syria (WHO, 1984).

P. perfiliewi was recently proven to be the vector of cutaneous leishmaniasis, caused by L. infantum, in Italy (Maroli et. al., 1987) and is the suspected vector in Algeria (Belazzoug, 1987). It is also a suspected vector of visceral leishmaniasis in Tunisia (Ben-Rachid & Ben-Ismail, 1987).

The dramatic increase in the incidence of visceral leishmaniasis in many Middle Eastern countries including Saudi Arabia (Peters et. al., 1985; Al-Zahrani et. al., 1988), occupied Palestine (Jaffer et. al., 1988) and Egypt (Lane, 1986) indicates the need for intensive investigation of possible foci of the disease in Jordan.

The abundance of P. major and P. perfiliewi, both possible vector species, in areas where they exhibit an endophilic behaviour and where dogs which are potential reservoirs, are common and resting sites are available indicate that some of these areas are at risk of becoming new foci of visceral or cutaneous leishmaniasis if the appropriate causative agents were to be introduced to them.

The knowledge of the seasonal fluctuation and behaviour of those sandfly species which are of potential importance as vectors, either in current foci or risk areas, will be a great asset in the attempt to control the leishmaniasis by control of their vectors.

References

1. Al-Zahrani, M.A., Peters, W., Evans, D.A., Ching Chin, I., Smith, V. & Lane, P.R. (1988). Phlebotomus sergenti, a vector of Leishmania tropica in Saudia Arabia. Trans R Soc Trop Med Hyg, 82, 857.

2. Anonymous (1984). National Atlas of Jordan. 1: Climate and Agroclimatology. Jordan National Geographic Centre. 135 pp.

3. Belazzoug (1987). Current situation in regard to leishmaniasis in Algeria. Proceedings of an International Workshop held in Ottawa, Canada, 55-57.

4. Ben-Rachid, M.S. & Ben-Ismail, R. (1987). Current situation in regard to Leishmaniasis in Tunisia. Proceedings of an International Workshop held in Ottawa, Canada, 58-59.

5. Butticker, W. & Lewis, D.J. (1983). Some ecological aspects of Saudi Arabian sandflies (Diptera: Psychodidae). Fauna of Saudi Arabia, 5, 479-530.

6. Dedet, J.P., Addadi, K. and Belazzoug, S. (1984). Les Phlebotomes (Diptera: Psychodidate) d'Algerie. Cha. O.R.S.T.O.M., ser. Ent. Med. et Parasitol., 22, n°2, 99-127.

7. Jaffe, C.L., Keren, E., Nahary, O., Rachamin, N. and Schnur, L. (1988). Canine visceral leishmaniasis at Wadi Haman, in Israel. Trans R Soc Trop Med Hyg, 82, 852-853.

8. Killick-Kendrick, R., Leaney, A.J., Peters, W., Rioux, A.J. and Bray, R.S. (1985). Zoonotic cutaneous leishmaniasis in Saudia Arabia: the incrimination of P. papatasi as the vector in the Al-Hassa Oasis. Trans R Soc Trop Med Hyg, 79, 252-255.

9. Lane, R.P. (1986). The sandflies (Diptera: Phlebotominae) of Egypt. Bulletin of the British Museum (Natural History), (Entomology), 52, 1-35.

10. Lane, R.P., Abdel-Hafez, S. and Kamhawi, S. (1988). The distribution of phlebotomine sandflies in the principal ecological zones of Jordan. Medical and Veterinary Entomology, 2, 237-246.

11. Le Blancq, S.M. & Peters, W. (1986). Leishmania in the Old World: 2. Heterogeneity among L. tropica zymodemes. Trans R Soc Med Trop Hyg, 80, 113-119.

12. Maroli, M., Gramiccia, M. and Gradon, L. (1987). Natural infection of Phlebotomus perfiliewi with Leishmania infantum in a cutaneous leishmaniasis focus in the Abruzzi region, Italy. Trans R Soc Trop Med Hyg, 81, 596-598.

13. Naggan, L., Gunders, A.E., Dizian, R., Dannon, Y., Shibolet, S., Ronen, A., Schneeweiss, R. & Michaeli, D. (1970). Ecology and attempted control of cutaneous leishmaniasis around Jericho in the Jordan Valley. Journal of Infectious Diseases, 121, 427-432.

14. Oumeish, Y., Saliba, E. & Allawi, T. (1982). Cutaneous leishmaniasis an endemic disease in Jordan. Jordan Medical Journal, 16, 55-61.

15. Peters, W., Elbihari, S., Liu Ching, S.M., Le Blancq, D.A., Evans, D.A., Killick-Kendrick, R., Smith, V. & Baldwin, C.I. (1985). Leishmania infecting rural animals in Saudi Arabia. 1. General Survey, Trans R Soc Trop Med Hyg, 79, 831-839.

16. Peters, W., Killick-Kendrick, R. (1987). The leishmaniasis in Biology and Medicine: Biology and Epidemiology, 1, Academic Press, London.

17. Qubain, S. (1989). Leishmaniasis control as part of primary health care in Jordan, WHO Leish/WP, 19, 1-2.

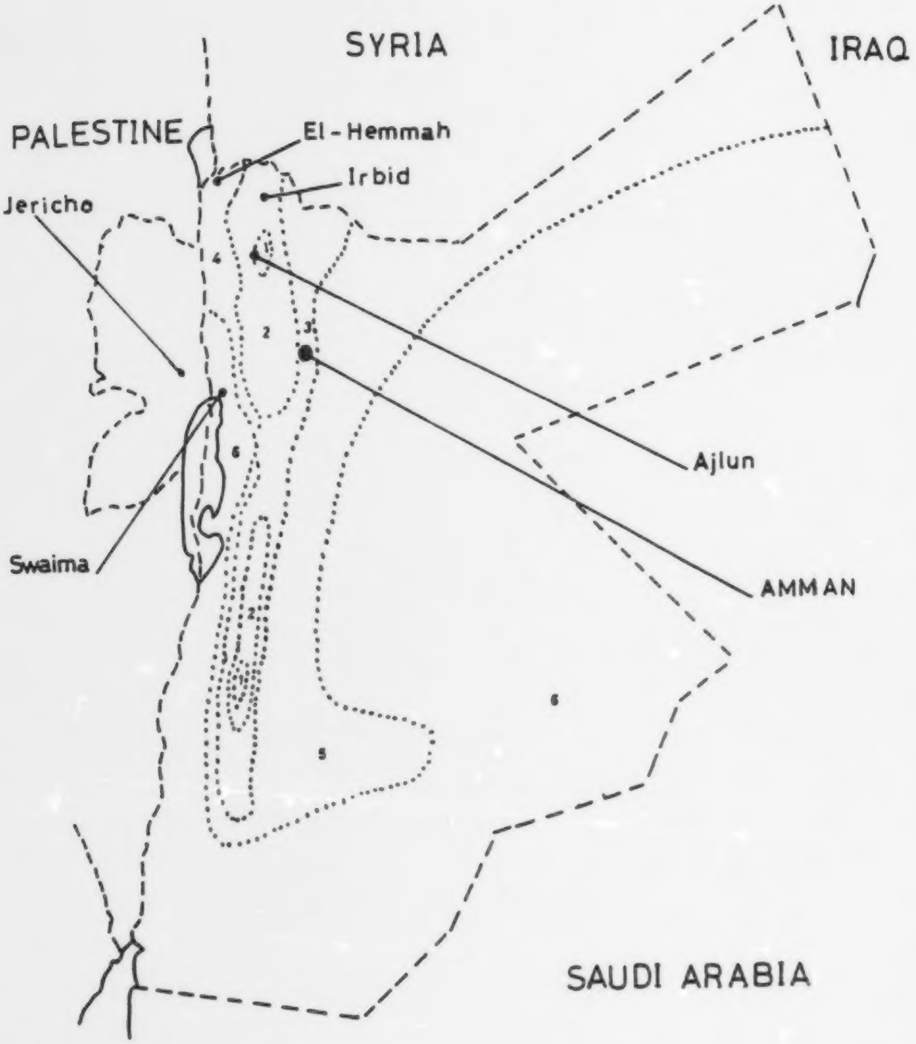
18. Saliba, E.K., Oumeish, O.Y., Haddadin, J., Amr, Z. & Ashford, R.W. (1985). Cutaneous leishmaniasis in Mowaqqar area, Amman Governate, Jordan, Ann Trop Med Para, 79, 139-146.

19. Saliba, E.K., Higashi, G.I., Yates, J.A. & Oumeish O.Y. (1987). Cutaneous leishmaniasis in Jordan: Biochemical identification of human and _Psammomys_ _obesus_ isolates as _L. major_, Ann Trop Med Para, 82, n°1, 21-25.

20. Schlein, Y., Warburg, A., Schnur, L.F. & Gunders, A.E. (1982). Leishmaniasis in the Jordan Valley 2. Sandflies and transmission in the central endemic area, Trans R Soc Trop Med Hyg, 76, 582-586.

21. WHO (1984). The leishmaniasis. Report of the World Health Organization expert committee, Technical report series 701.

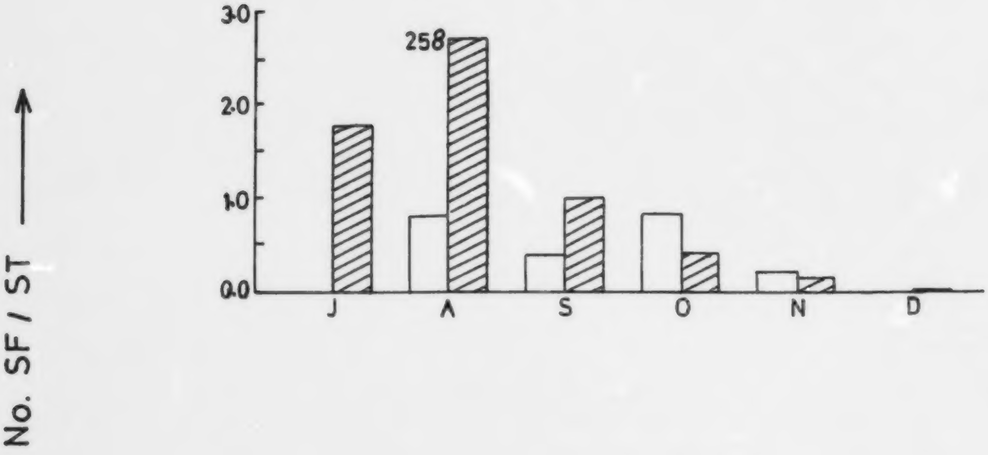
Figure 1: The map of Jordan divided into 6 climatic zones according to the model of Koppen (anon., 1984). It also indicates the location of the 5 sites sampled in this study.


SYRIA
IRAQ
PALESTINE
El-Hemmah
Irbid
Jericho
Ajlun
AMMAN
Swaima
SAUDI ARABIA
1
2
3
4
5
6

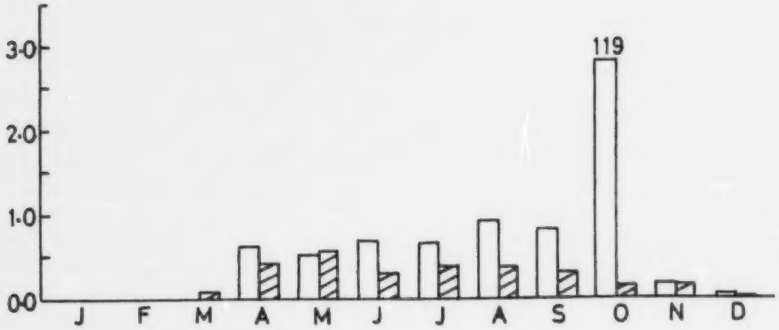
Key to the climatic zones of Koppen:
1 = Cool temperate rainy climate
2 = Warm temperate rainy climate
3 = Cool steppe climate
4 = Warm steppe climate
5 = Cool desert climate
6 = Warm desert climate

Figure 2: Shows the seasonal fluctuation of *Phlebotomus papatasi* in Swaima for

a - 1986 collections:

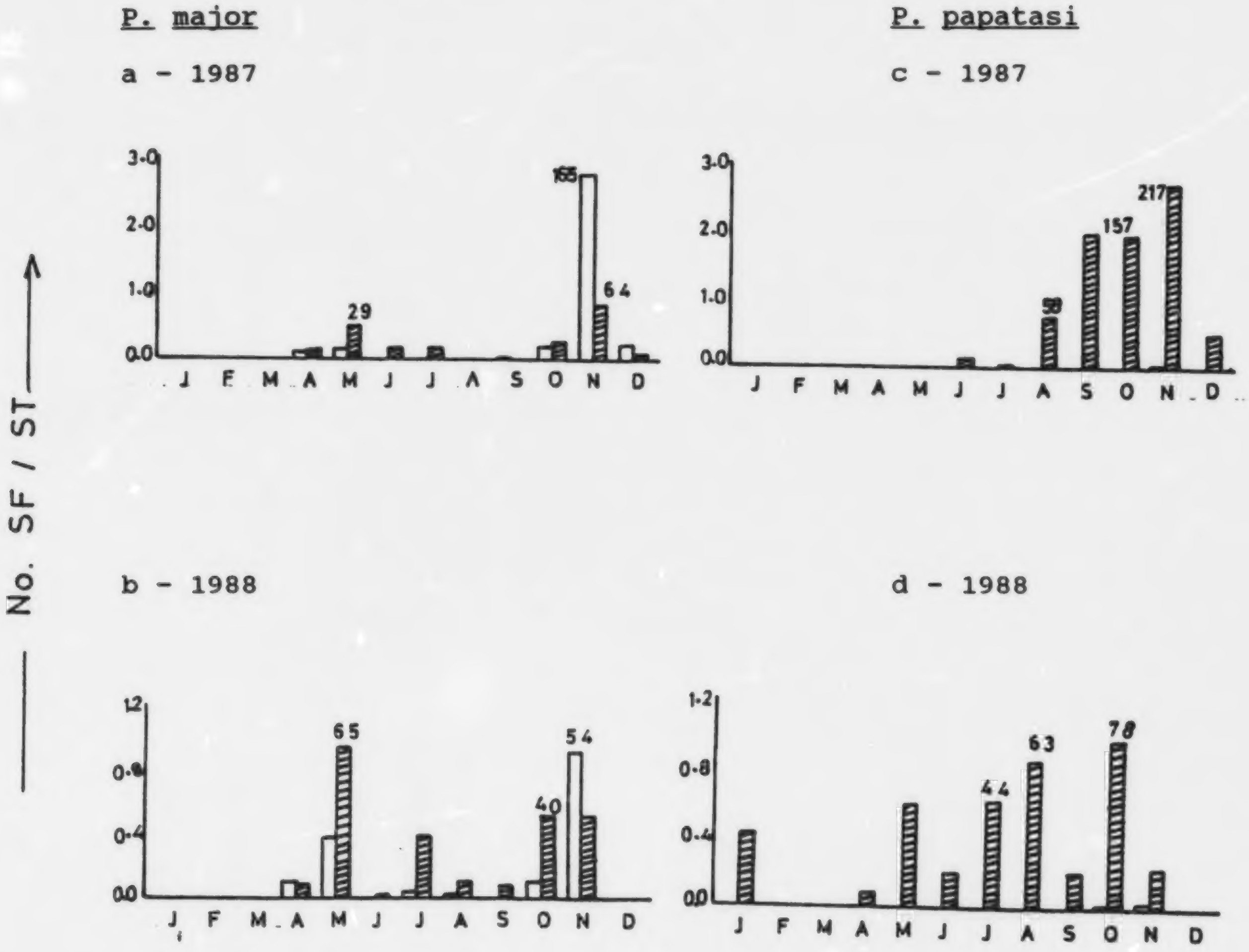


b - 1987 collections:



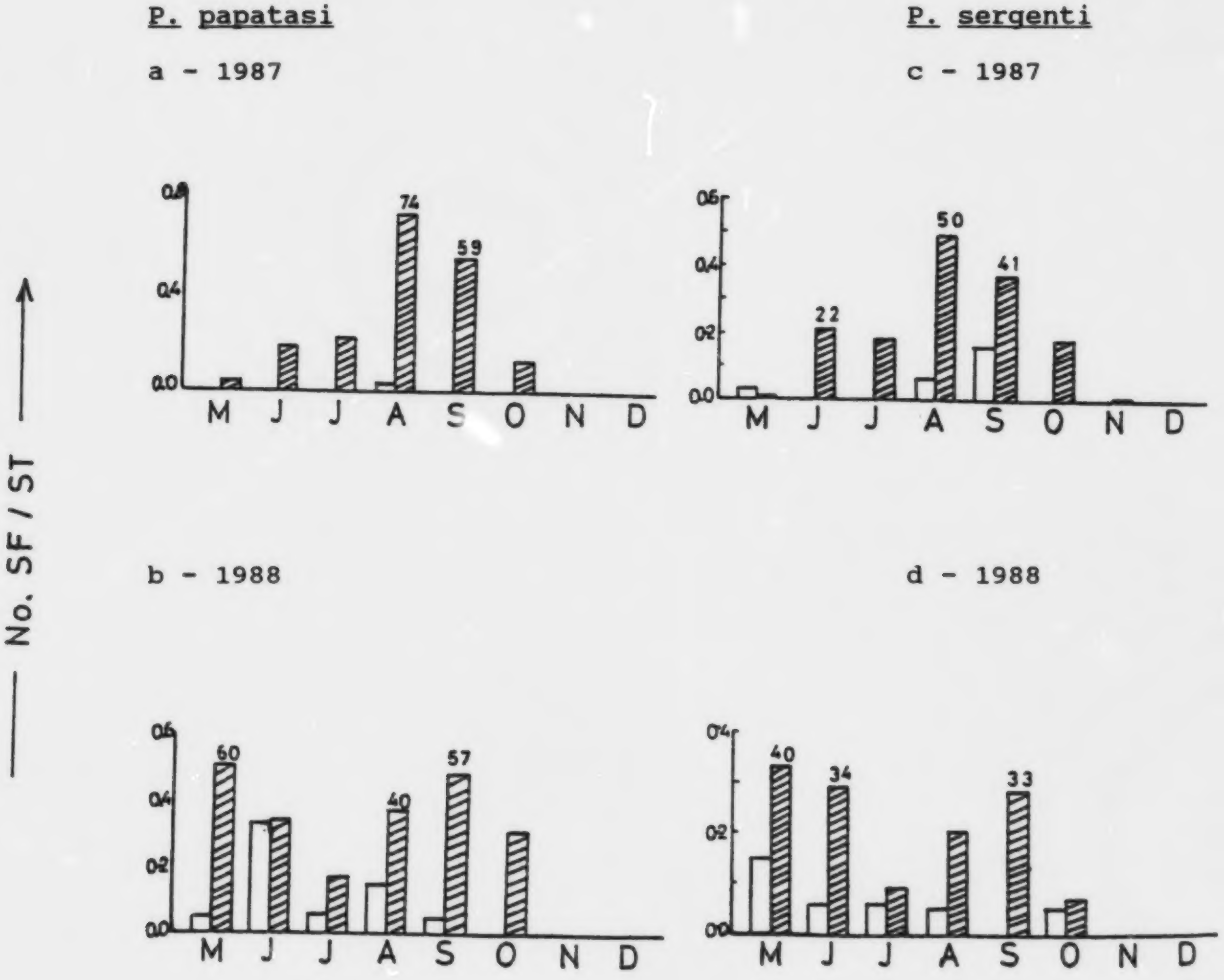
KEY:
SF = Sandflies
ST = Sticky traps
▭ = Wild habitats
▨ = Domestic habitats

Figure 3: Shows the seasonal fluctuation of *Phlebotomus major* and *P. papatasi* in El-Hemmah in 1987/1988:



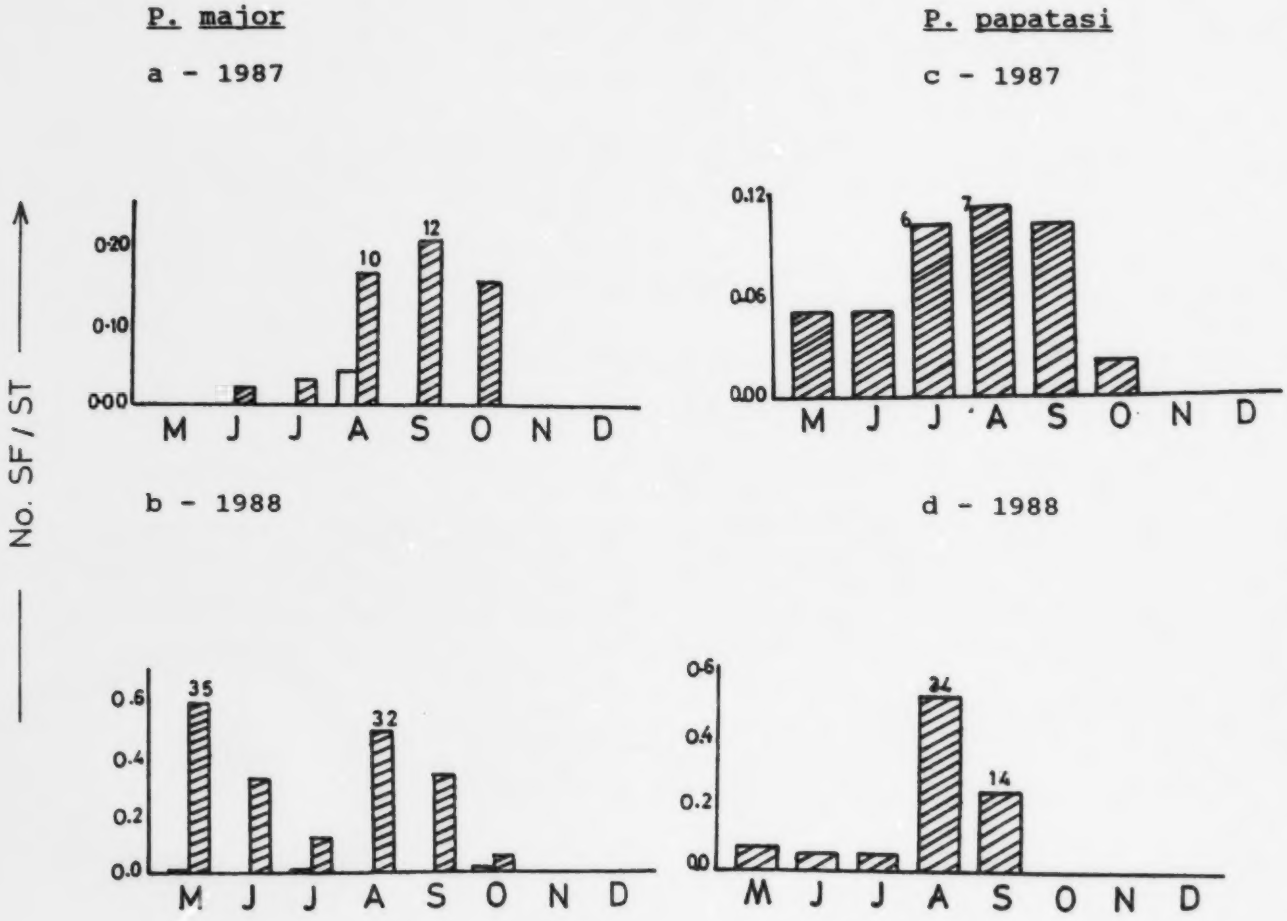
KEY:
SF = Sandflies
ST = Sticky traps
▭ = Wild habitats
▨ = Domestic habitats

Figure 4: Shows the seasonal fluctuation of *Phlebotomus papatasi* and *P. sergenti* in Amman Area in 1987/1988:



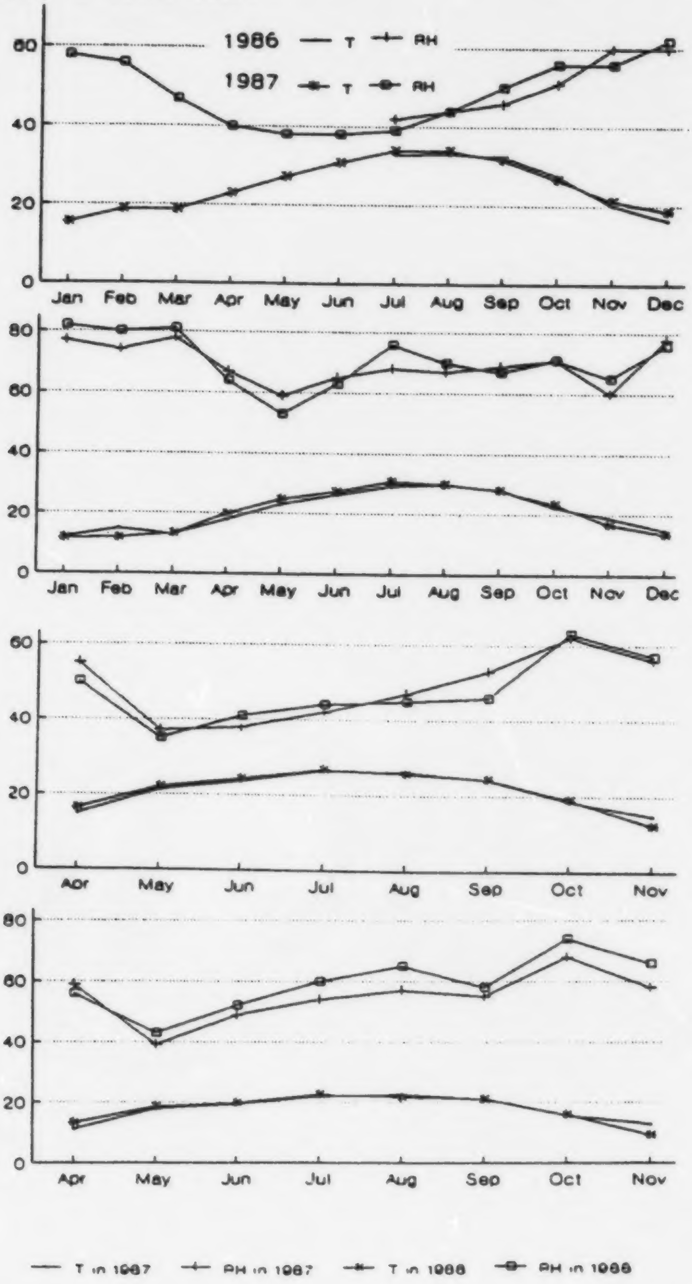
KEY:
SF = Sandflies
ST = Sticky traps
□ = Wild habitats
▨ = Domestic habitats

Figure 5: Shows the seasonal fluctuation of *Phlebotomus major* and *P. papatasi* in the Ajlun Mountains in 1987/1988:



KEY:
SF = Sandflies
ST = Sticky traps
▭ = Wild habitats
▨ = Domestic habitats

Figure 6: Shows the temperature (T °C) and the relative humidity (RH %) in 1987 & 1988 for:



a - Swaima :

b - El-Hemmah :

c - Amman Area :

d - The Ajlun Mountains :

T = Mean Monthly Temperature
RH = Mean Monthly Relative Humidity

EPIDEMIOLOGY OF CUTANEOUS LEISHMANIASIS IN THE WEST BANK

By Dr. Hisham Arda M.D

Nablus

Cutaneous Leishmaniasis "C.L" was known to be endemic in the Jordan Valley "J.V." for decades(1) where it was called "Jericho Boil".

It is usual to observe a scar of a healed lesion on the face or an exposed part of the body of natives from the J.V.

In a previous report by the Author on C.L. in the West Bank from 1972-1980(2), 237 cases were reported during this period, Table 1 shows their geographic distribution.

From the J.V. only 24 cases were reported, but most of the cases were from other areas. From Salfeit, a hilly area, 30 km south of Nablus 131 cases were seen, but the disease was never been reported from there. An epidemiological study was done in Salfeit by Health Authorities during 1974, it was found that the Sand Fly Phlchotomus Papatasi existed and infected ratus ratus rodente by Leishmania Donovani were isolated. A Leishmania Test Study was carried out by Dr. Arda in Salfeith 1974 on 800 individuals of the area and 40 of them 5% were found to had a positive Leishmanin Test. This result of Leishmania Test means a high susceptibility of the population to C.L. and that the disease is recent in the area, as in areas with long history of endemicity Leishmanin Test

Table 1. Geographic Distribution & No. of Population 1972-1980

Area	No. Pts	Population (thousands)
Salfeit	131	28
Jenin	33	105
Tulkar	12	90
Nablus	12	124.5
J.V.	24	11
Ramallah	8	
Hebron	3	
S.A. Iraq	14	
Total	237	

may be 90% or more positive between the population. Although in this study 33 cases were from Jenin Area, mainly villages north and east of the city, no single case was reported from Qabatyah village which is few kilometres south of Jenin city.

During the period March 1983-August 1987, 173 cases of C.L. were diagnosed by the author(3) 90 of these cases were males, and 83 were females.

Most of the cases i.e. 138 were diagnosed during 1986-1987 and 62 of them were found from the village of Qabatyah which was free from the disease, and all the patients had never been to the J.V.

From September 1987 to September 1989, 69 cases of C.L. were diagnosed by the author (32 of them were males, and 37 were females), 46 cases were diagnosed during 1989 period. Table II shows the geographic distribution of these cases. 36 cases came from the Jenin including Qabatyah, 22 cases from J.V., 7 cases from Salfeit.

In 9 families two members of the same family were found to had the disease, and in one family five members were seen to had C.L.

62 patients had 1-3 lesions on the exposed parts of the body, the highest number of lesions had recent disease 1-4 months.

In the First Study 1972-1980 multiplicity of the lesions in the same patient and the site of the lesions on unexposed parts of the body were found more frequent. Some of those patients were Summer Visitors to our area i.e. the origin of their infection was from Saudi Arabia (Table I).

Table II. Geographic Distribution of Cases 1988-1989

Area	No. Pts
Salfeit	7
Jenin	36
Tulkarm	1
Nablus	2
J.V.	22
Ramallah	1
Total	69

The observations to be mentioned:

a. A new endemic foci of C.L. are extending outside the J.V. for example Qabatyah, Jenin city, and the village which are at the north and east of the city such as Kufradan, Seilet El Hartheyah, Beit Qad, and Dair Abu Daief.

b. Salfeit is still a continuous source of new cases of C.L. 7 cases were seen in the year 1988-1989.

c. Cases from the Jordan Valley has increased in the last two years, (22 cases out of 69, Table III) as compared to (24 cases out of 237, Table I).

Table III shows cases of C.L. reported between the period of 1980-1989 at Jericho Health Office. 223 cases were reported (124 of them were males and 99 cases were females). During 1988-1989 period 25 cases were reported from the Jericho Health Office, and the author has reported 22 cases giving a sum of 47 cases from the Jordan Valley.

There is no case records available in Jericho Health Office before the year 1980.

13 cases of Kala Azar were reported until the year 1978 at Al Watani Hospital in Nablus (Dr. Abu Leil) these patients came from different areas of the West Bank outside the Jordan Valley, but since then only two cases have been reported at the same Hospital.

Table III. Cases of C.L. in Jericho 1980-1989

Year	Males	Females	Total
80	10	8	18
81	32	34	66
82	9	13	22
83	16	10	26
84	27	18	45
85	10	5	15
86	2	2	4
87		2	2
88	8	2	11
89	10	4	14
Total	124	99	223

There is no specific program for control of C.L. in the West Bank. Limited facilities for treatment and spraying with D.D.T. are available at Jericho city, and some areas around by local Health Authorities, and UNRWA.

Unfortunately, this may explain why we still had 47 cases in the last two years in this place.

Treatment of C.L. is basically by using Pentavalent Antimony as Pentostam intralesional or Intramuscul as when lesions are few in number. Results of treatment are good. perilesional infiltration improve the cure rate, diminish the healing time and the number of injections need per patient. Exposure of ulcerated lesions to Infra red rays also help to diminish healing time and number of injections of Pentostam. The same was also noticed with the addition of Ketoconazole 200 mg tablet orally per day for 3-4 weeks. However, the Ketoconazole was found ineffective if given alone.

In Conclusion

1. Cutaneous Leishmaniasis is being a real health problem in the West Bank; as endemic areas are being more wide spread.
2. Control and preventive measures are lacking, and are urgently needed so as to avoid a more serious situation.
3. Epidemiological studies to specify Leishmania causing C.L., species of Sand Flies and reservoir animals and their ecology (especially population dynamics and abundance) in the West Bank are lacking.

References

1. Oumaish, O. & Saliba, E. 1987. Epidemiology of Cut. Leish. in Jordan. SPASLZ, 3-5 Nov. 1987, KHMC, Amman, Jordan (Abstract).
2. Arda, H. 1987, Cut. Leish. in the West Bank. New Endemic Focus. SPASLZ, 3-5 Nov. 1987, KHMC, Amman, Jordan (Abstract).
3. Abu Leil, F. 1978, personal communication.

CUTANEOUS LEISHMANIASIS (C.L.) IN SYRIA:
GEOGRAPHICAL DISTRIBUTION AND CLINICAL REMARKS

By Mamoun Jallad, M.D.

Cutaneous Leishmaniasis in Syria is an endemic disease. It had existed for hundreds of years and was known with its famous name "Aleppo boil". The old Arab physicians had described similar lesions that would stay a year or more before healing. The British physicians were perhaps first in describing Aleppo boil specifically: Pocock in 1745, Russel brothers in their book "The Natural History of Aleppo" in 1756. It was after 1920 when French and Syrian physicians had conducted studies on "bouton d'Orient". Among the French were Denaeux, Trabaut and Chevalier, and among the Syrian were El-Knani, Koussa and Tarakji.

Geographical Distribution

The geographical distribution of C.L. Syria was sharply limited to the endemic foci in the North and North-eastern regions of the country. It was after the middle of this century when C.L. in Syria has taken a completely new dimensions. New outbreaks have been encountered in most provinces in the last three decades. A new endemic area in the South (north-east of Damascus) has been detected.

Distribution of C.L. in Syria before 1960 (see Map I): The main endemic areas were: the city of Aleppo, its vicinities, the Euphrates valley and plains of the Euphrates tributaries: El-Balikh and El-Khaboor. Other endemic foci did exist in Idleb and Latakia provinces. Cases of cutaneous leishmaniasis were encountered with the greatest frequency in Aleppo, Deir-azzor, Raqqah and Idlib. No endemic area was existed in Damascus as it has wrongly mentioned in a famous text book.

The New Outbreaks of C.L. in Syria after 1960 (see Map II): New outbreaks of C.L. have been detected after 1960 in most provinces in Syria. Some outbreaks have occurred in a previously endemic areas: as the outbreak of the new city Al-Thourah - previous name Al-Tabkah - on the Euphrate's Dam. Most new inhabitants developed C.L. Other outbreaks have been encountered in Latakia province (rural areas of Gebleh), in Tartus province (Dreikeesh), in Hama nad Idlib.

The outbreak of C.L. in the South of Syria (see Map III): Prior to 1960 no endemic foci were detected in the South (Provinces of Damascus, Der'a and Seweda). However, numerous cases of C.L. were reported yearly and most of these cases were imported from the endemic areas (mainly in the cotton season) or from abroad. I have recorded numerous cases of C.L. imported from Saudi Arabia in workers after return to their villages in the Kalamoon (north east of Damascus). A new endemic foci in the South is the town of Dumeyr, 40 km east of Damascu city. Other endemic areas are: Nebk, Dier-Attiyeh, Gregeer and Yabrud. Cases of C.L. have been reported in the vicinities of Damascus: Yarmook, Sitt-Zenab, Duma, ...Some of these cases were imported from Iraq, Iran and Afghanistan. No proven case of C.L. had occurred in the old city of Damascus.

Factors may be contributed to the new outbreaks of C.L. in Syria

Possible factors that had played a role in the new outbreaks of C.L. in Syria include:

- Pre-existence of animal reservoir and vectors in some rural areas (as in Dumeyr).
- The development of new human settlements and housing in the endemic areas, as the Euphrates Dam and the new city of Al Thorah.
- The development of camps and bases in a previously desert areas.
- The construction of new highways all over the country.
- The large number of C.L. cases imported to a suitable area.
- The poor sanitary facilities in some endemic areas create conditions for spreading the disease.

Remarks and Conclusion

Clinical Remarks: An important clinical feature noted at the onset of the outbreaks is: several members of a family, of different ages, represent all with cutaneous lesions, at the same time. Same feature may be encountered when a whole family moves on to an endemic area.

- Cases of C.L. in the South (see slides) were of the "rural form" L. Major. Lesions were mainly "wet", red, raised and ulcerated. Duration of the lesions was relatively short, and healing took place within 6 months.

- Cases of C.L. from the North (Aleppo, Idlib,..) were more of the "urban form" L. Tropica. Lesions were "dry", slightly ulcerated and some may stay without ulceration. Duration of the lesions was relatively longer (1 year or more).

- All forms of C.L., the acute form (the "wet" and the "dry") and the chronic forms (the lupoid and the recidivans) do exist in Syria (see slides), but NO disseminated cutaneous leishmaniasis has been reported.

Epidemiological Remarks:

- C.L. in the South seems to be Zoonotic. Proven cases were L. Major (Dr. Khiami). The common vector is P. papatasi. Reservoir possibly gerbils?

- C.L. in the North seems to be mainly Anthroponotic. Most cases are typical urban forms for L. Tropica. The vectors are P. papatasi and P. sergenti. Possible reservoirs are infected men, rodents and dogs.

Conclusion

The new outbreaks of C.L. in Syria represent a serious problem and interesting fields for investigation. Further Epidemiological studies and control measures are badly needed.

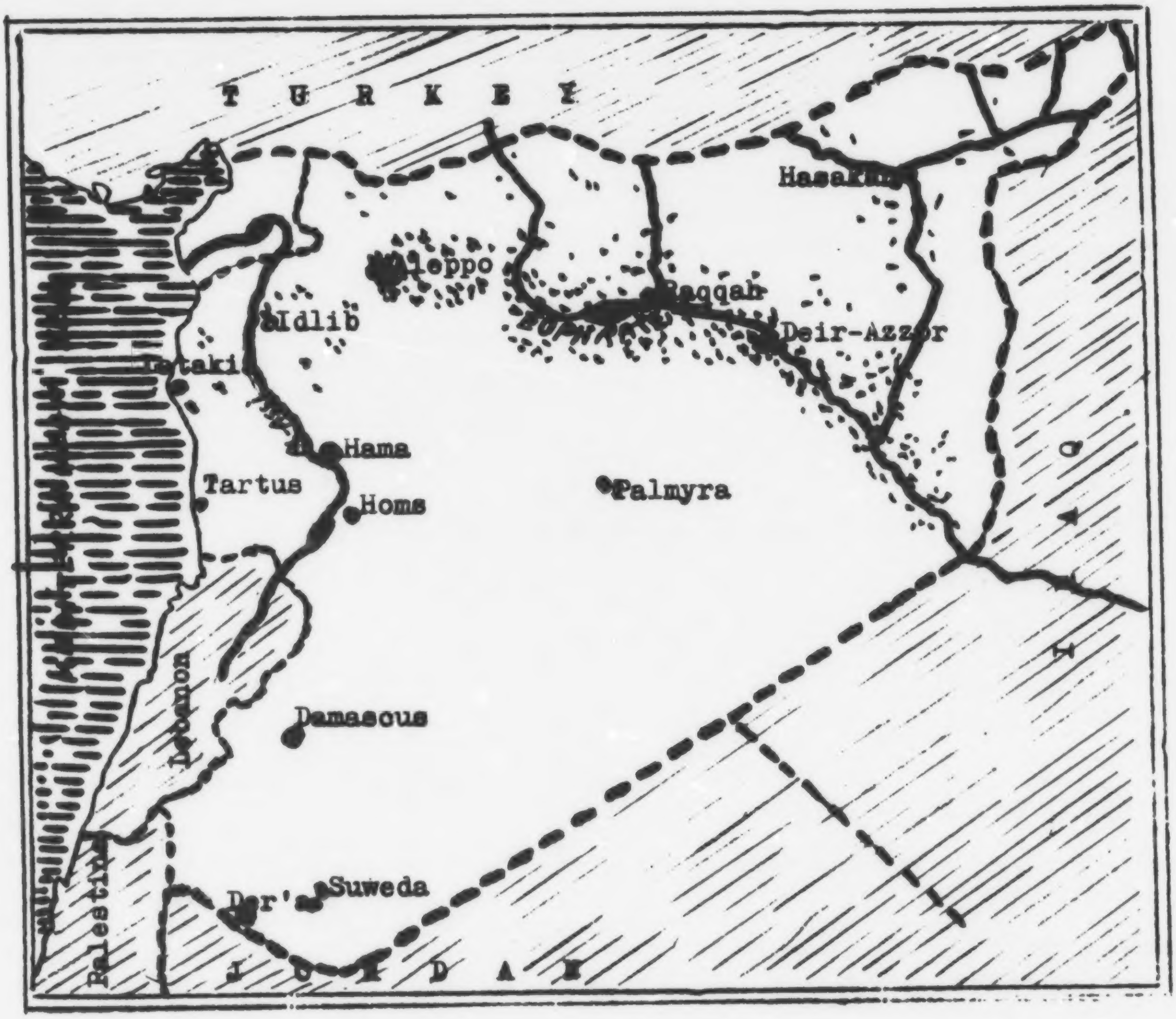
References

1. R. Hagbal - Thesis on Cutaneous Leishmaniasis (1984) Damascus University.

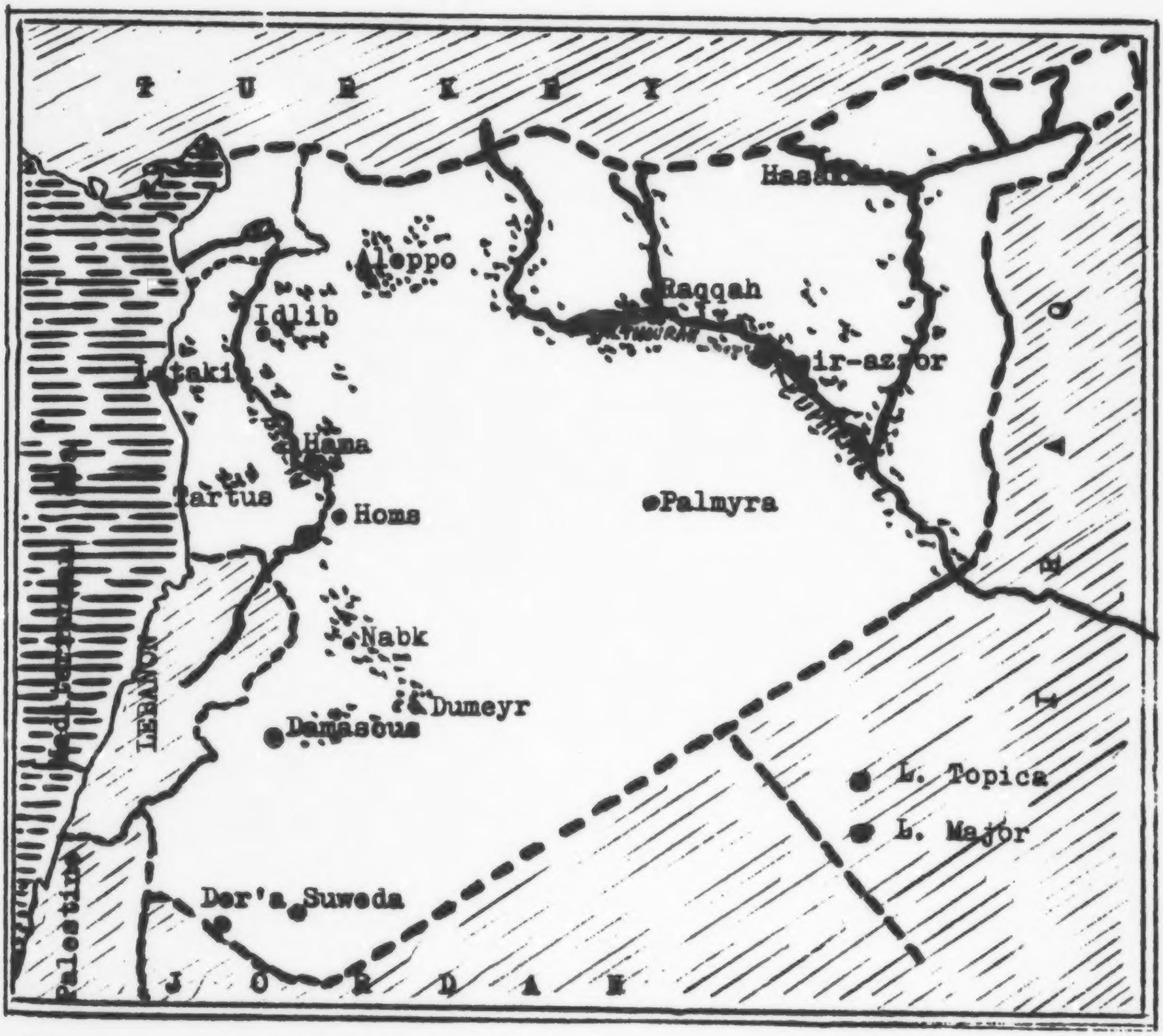
2. M.R. Hadaya - Thesis on Cutaneous Leishmaniasis In Aleppo Province (1986).

3. R. Khoury - Thesis on Cutaneous Leishmaniasis (1988) Damascus University.

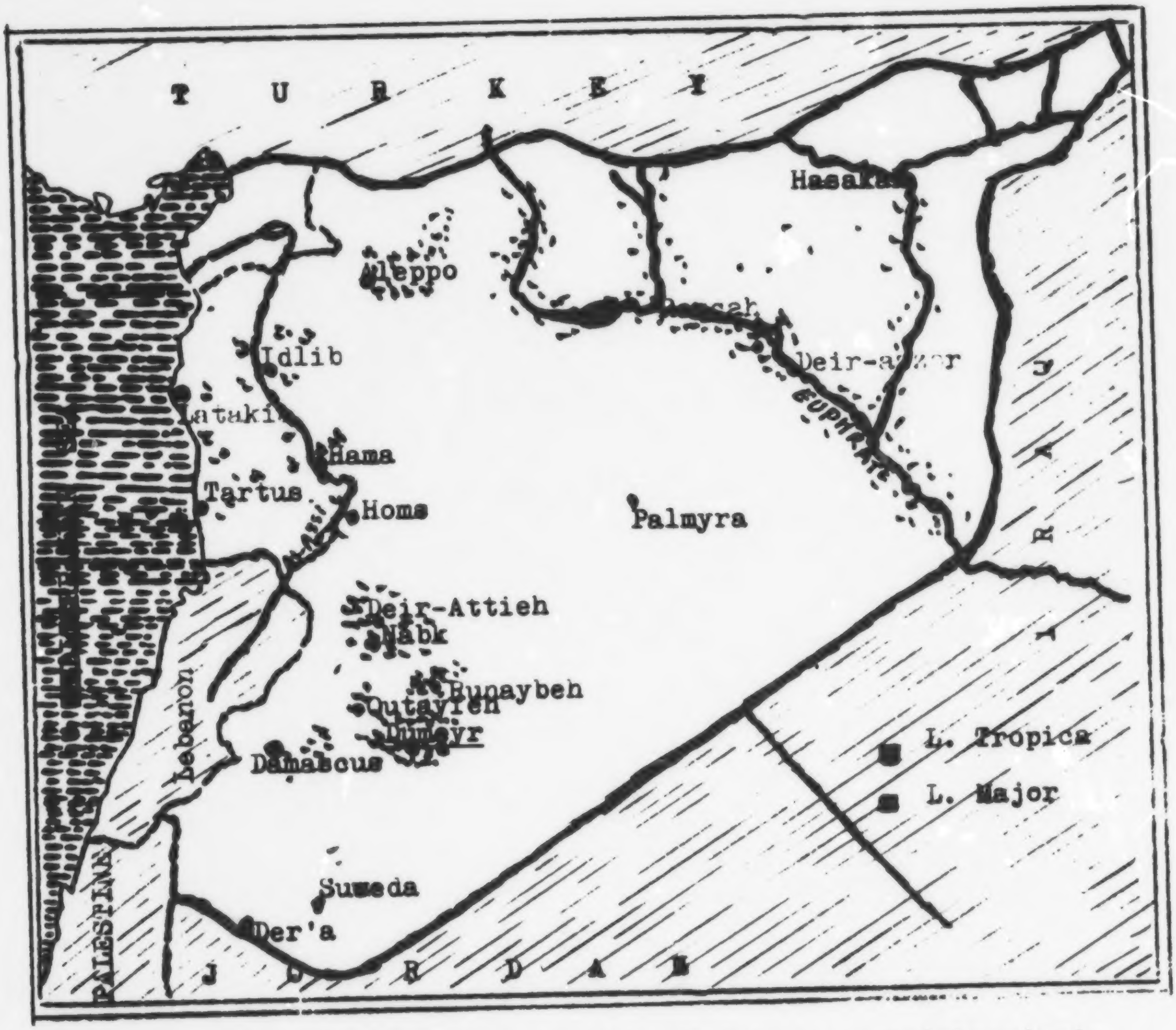
4. National reports for the Ministry of Health, Syrian Arab Republic (1983, 1987).


TURKEY
Hasakah
Aleppo
Raqqah
Idlib
Deir-Azzor
Lataki
Hama
Tartus
Homs
Palmyra
Damascus
Lebanon
Suweda
Der'a
Palestine
JORDAN

MAP I: Geographical Distribution of Cutaneous Leishmaniasis in (prior to 1960)


TURKEY
Hasa
Aleppo
Raqqah
Idlib
Lataki
ir-azor
Hama
Tartus
Homs
Palmyra
Nabk
Dumeyr
Damascus
LEBANON
Palestine
Der'a
Suweda
JORDAN
● L. Topica
● L. Major

MAP II: Geographical Distribution of Cutaneous Leishmaniasis in Syria and the New Outbreaks (after 1960)


TURKEY
Hasaka
Aleppo
Raqqah
Idlib
Deir-azzor
EUPHRATE
Latakia
Hama
Tartus
Homs
Palmyra
IRAQ
Deir-Attieh
Nabk
Ruhaybeh
Qutayfeh
Dumeyr
Damascus
Lebanon
L. Tropica
L. Major
Suweda
Der'a
JORDAN
PALESTINE

MAP III: Geographical Distribution of Cutaneous Leishmaniasis in Syria (prior to 1960)

THE THIRD PAN ARAB SEMINAR ON LEISHMANIASIS AND OTHER ZOONOSES

EXISTENCE OF LEISHMANIA MAJOR IN THE SOUTH OF SYRIA CAUSATIVE AGENT OF DAMASCUS BOLL

A. Khiami

Department of Parasitology, University of Damascus Syria

Summary

We present in this study the result of isoenzymatic analysis of one stock of Leishmania isolates from a patient living in Dmeir village at 60 km from Damascus (Syria). Leishmania major MON-26. This zymodeme is found for the first time in Syria.

in Syria exist two strains Leishmania tropica MON-76 in Aleppo town (S. Belazzoug, F. Pratlong, J.A. Rioux) and Leishmania major MON-26 in the villages surrounding Damascus as we found in our study.

Introduction

Since a long time cutaneous Leishmaniasis is known in Aleppo (Adler and Theodor 1929). Recently the strain of aleppo was classified as Leishmania tropica MON-76 (S. Belazzoug, F. Pratlong, J.S. Rioux 1988). The strain of Damascus subbords is still unknown, till recently we have done multiple visits during the winter of 1988 to the village of Dmeir. At 60 km from Damascus, where a military camp and an aerodrome exist we refer in this note these observations and the result of our investigation.

Material and Methods

We took material from the periphery of the cutaneous lesion with the scalpel. Smears were done and coloured with Giemsa. Stratins were isolated on NNN and BHB media. Isoenzymatic identification was one by the technic of Maazoun and al (1981), modified by Moreno and al (1986). Mass cultures were washed four times with physiologic water. The first time at 9%, the next at 3%, the last two at 9%, then leptomonas are treated with triton X-100 at 5%, then they are conserved in liquid nitrogen in the form of pearls of 50 ul. The protein extract intended for electrophoresis is defreezed when needed. Then we centrifuge for 5 minutes at 10.000 t/min. We proceed to the absorption of the supernatant on small rectangular whatman paper no. 3 which will be placed vertically in a thick starch gel (Imm). We use four buffers triscitrate pH 9.4, tris-citrate pH 8.6, tris-maleate EDTA pH 7.4 tris-maleate pH 7.4. Different electromorphs were identified using relative mobility to a standard strain. The Zymodeme contains in the same taxonomic unit strains showing the same enzymatic profile 15 systems were used. malate dehydrogenase (MDH I). EC I.I.I.37 malic enzyme (ME), EC I.I.I.40 isocitrate dehydrogenase (ICD) EC I.I.I.42. 6 phosphogluconate dehydrogenase (PGD) EC I.I.I.44. glucose-6 - phosphate-dehydrogenase (G6PD) EC I.I.I.49 glutamate dehydrogenase (GLUD) EC I.4.I.3 NADH diaphorase (DIA-I). EC I-6.2.2 purine nucleoside phosphorylase (NPI) EC 2.4.2.1 purine nucleoside phosphorylase (NP2) EC 2.4.2. glutamate oxaloacetate transaminases (GOT1 - GOT2) Ec 2.6.1.1. phospho-glucomutase (PGM).EC 2.7.5.1. fumarate hydratase (FH).EC 2.4.1.2. mannose phosphate isomerase (MPI)EC 5.3.1.8. glucose phosphate isomerase (GPI) EC 5.3.1.9.

Results and Interpretations

Twenty patients were examined at Dmeir village. In Dmeir, cutaneous Leishmaniasis exist, almost equally between males and females and in different age groups but is more frequent in young age group and in infants most of the patients have multiple lesions generally on the non covered parts of the body most of the smears taken from the lesions and coloured with Giemsa were positive. Most of the cultures were positive but leptomonas on BHB appeared and disappeared quicker than on NNN. We succeed to classify one stock. Wael Mussalam male 10 years. One lesion on the right cheek started 6 months age. Presence of many Leishmania in the direct exam of the smear. Culture on both media BHB and NNN was positive: strain MHOM/SY/87/LEM 1226. Isoenzymatic identification shows that the isolated strain belongs to the complex. Leishmania major zymodeme MON-26 this zymodeme will correspond to the next enzymatic profile MDH 160 ME 088 ICD 100. PGD 122 G6PD 096 GLUD 200, DIA 100 NP1 400 NP2 090, GOT1 100 GOT2 110 PGM 118, GH 079 MPI 077. Treatment by the numeric technics of classification (lanotte and al 1981) will permit to situ this zymodem in the dendyogram (Fig 1). Comparison two by tow of zymdoems will be done with the help of the standard genetic distance of Nei(D), and we will be able to edify the taxonomic and Chronistic dendrogram. This zymodem L. Major MON-26 exist also in South Yemen, Saudi Arabia, Iraq, Egypt URSS. As if all these regions of the Middle-East constitute a geo-epidemiological entity. This situation can result from the historical diffusion of the parasite across these regions diffusion related to the climatic variations nadhuman activities. Complete epidemiological study of Dmeir focus will be very interesting especially if the study will take a bigger number of cases and will be extended to the animal reservoir and the phlebotomus responsible for this disease.

CUTANEOUS LEISHMANIASIS IN ALEPPO SYRIA

Pr. A. Chehade - Dr. A. Mouakeh

Department of Dermatology, Aleppo University Hospital

The British scientist, Pocoek, who was interested in Oriental Studies, was the first to document cutaneous Leishmaniasis in Aleppo in 1745.

Aleppo City is located at the northern part of Syria near the southern borders of Turkey.

Cutaneous Leishmaniasis has several other names such as: Aleppo boil, Baghdad boil, East boil and tropical ulcer.

In 1742, the two British scientists, the Russel brothers, outlined the basic clinical features of this cutaneous disease in their book "The Natural History of Aleppo City".

In 1787, the french traveller, Volney, described the disease in his book "A Voyage to Egypt and Syria".

In 1832, the French vice-consul in Aleppo, described the infection accurately in the French Magazine, "La Gazette Médicale".

In 1833, Dr. Gilhou of the Paris Academy of Sciences suggested that cutaneous Leishmaniasis should be named "Aleppo boil".

Several other Syrian and French physicians continued to study the different aspects of this disease and to describe new features related to it. Among them were: Chevalier, Al-Knani, Kussa and Tarakji.

In 1903, the American physician J.H. Wright discovered the infective agent ins a smear taken from a boil which was seen on an immigrant child. He named the parasite he discovered "Leishmaniasis tropica".

This cutaneous infection is still seen in large numbers among citizens of Aleppo City in a population of two million people.

I have carried out a study in collaboration with my colleagues Dr. Abdul Karim in the Department of Dermatology at Aleppo University Hospital where a large number of patients present regularly with this disease.

In another part of the study, we surveyed school children in a number of schools located within endemic areas.

At the Department of Dermatology, approximately thirty patients presenting with different cutaneous complaints were seen daily. Out of these, 690 patients presented with cutaneous Leishmaniasis within a period of six months (15.3%). Of these cases, 344 were males and 346 were females.

As for school children who were included in the study, 343 cases of cutaneous Leishmaniasis were seen among 1855 students examined. The age range of the study population was 6-18 years. About (18.1%) of the study population was infected with different types of the Aleppo boil and the largest number of occurrences was found in the age group 10-12 years.

	Total No.	No. of cases infected with cutaneous Leishmaniasis	Percentage
Patients seen at the Department of Dermatology during 6 months	4 500	690	15.3%
School children examined	1 885	343	18.1%

Age range and age groups:

Age	No. of patients	Percentage
1 m - 1 year	14	4.3%
1 - 5 years	180	26%
6 - 10 years	136	19.7%
11 - 15 years	112	16.2%
16 - 20 years	70	10.1%
21 - 30 years	84	12.1%
31 - 50 years	52	7.5%
> 50 years	42	6%
Total	690	

We can notice the high incidence of infection among children in the age group 1 - 10 years.

As regards the distribution of the disease, we notice that the infection occurs in all different areas of the city regardless of the social or economic standards of these areas.

Testing for the Parasite

The positivity of the direct smear was high in lesions that were two months old and untreated. This positivity declines gradually as the lesions grow older. In general, the lesions become negative after six months.

Lesion Type

80% of the cases seen were of the dry type.
14.9% of the cases seen were of the wet type.
5.1% of the cases seen took various forms such as Lupoid, Furunke-like and Tumour-like.

The wet type used to be seen particularly with patients coming from the country areas, but we have seen some cases with wet lesions among residents of the city and vice-versa.

The Lupoid type is seen among children and adolescents. Recurrent forms may occur after treatment or after spontaneous healing. The Lupoid type as well as the recurrent Lupoid types are seen mainly on the face area.

Location

The lesions are usually located on uncovered areas of the body which are subjected to Phlebotomes bites, the most common areas being in the face and neck, then the limbs and then the rest of the body.

We recorded only one case, among 690 patients, where the lesion was located on the mucus membrane of the nostril and the direct smear proved positive.

Location on the upper or lower lips was common and usually left shallow scars with no damage or disfigurement as in the case with Mucu-cutanenous American Leishmaniasis.

Number of Lesions

Fifty per cent of the study population had a single lesion each, while the remaining fifty per cent had lesions that ranged in number between two and as many as 46 lesions. Some cases were reported where the number of lesions in one patient exceeded one hundred (100) and were distributed on different parts of his body.

Duration between appearance of lesion and patient presentation

The duration ranged between 15 days and 11 years. In most cases, patients presented one or two months after the appearance of a lesion. Most of the cases that presented late had been subjected to wrong treatments meanwhile or were of the Lupoid type.

There is a question regarding the possibility of re-infection with cutaneous Leishmaniasis. We had observed patients with previous scars of Leishmaniasis and who were re-infected with this disease.

Summary

Aleppo boil (Cutaneous Leishmaniasis) is still seen in Aleppo in large numbers.

In our study, and within a period of 6 months, 690 patients out of 4500 out-patients who presented at the Department of Dermatology at Aleppo University Hospital were diagnosed as having cutaneous Leishmaniasis.

The largest incidence is among children.

Various clinical types of the lesion are seen, especially the dry type and the wet type, and the important but less frequent Lupoid type.

References

1. Adler, S. & Theodor, O. 1929 - The distribution of sandflies and leishmaniasisin Palestine, Syria and Mesopotamia.

   Ann. Trop. Med. Parasite. 23.

2. Chehade, A.K. 1967 - The present situation of cutaneous leishmaniasis in Aleppo city and Northern Syria (LEISH/INF/67.13).

3. Chevalier, 1930 - Notes cliniques sur le bouton d'Alep. Rev. de Med. d'Hyg. Trop. No. 5 p. 221.

4. Corradetti, A. 1965 - Information on leishmaniasis collected in Lebanon, Syria, Iraq and Turkey. WHO/LEISH/67.6.

5. Coussa, M. 1932 - Contribution a l'étude et au traitement du Bouton d'Alep. Gaz. heb. des sci. med. de Bordereaux. No. 39.

6. Denoeux, 1924 - Le Bouton d'Alep, son diagnostic, son traitement. Marseille Med. p. 272.

7. Disont, M. 1832 - Une Notice sur le Bouton d'Alep. Gaz. Med. de Paris, p. 556.

8. El Khani, 1930 - Le Bouton d'Orient a Damas. Rev. de Med. d'Hyg. Trop. No. 5.

9. Gillhou, M. 1833 - Essai sur le Bouton d'Alep. These, Paris.

10. Khalil, A. 1934 - Dermal leishmaniasis. A study of an endemic focus in Egypt. (personal).

11. Kurban, A.K., Malak, J.A., Farah, F. and Chaglassian, H.T. 1966 - Histopathology of cutaneous leishmaniasis, Arch. Derm. 93.396.

12. Lewis, D.J. 1967 - Sandflies as vectors of leishmaniasis (LEISH/WP/67.3).

13. Monacelli, Pr. M. 1966 - Aspects clinique, anatomo-pathologiques et therapeutiques de la leishmaniose cutanee mediterrane. Concours medical 19-11, 1191.

14. Nadim, A. 1967 - Review of the present situation of leishmaniasis in Iran (LEISH/INF/67.12).

15. Pavlovsky Y.N. 1939 - Human disease with natural foci foreign languages publishing house Moscow.

16. Petit, J.H.S. 1962 - Chronic (luopid) leishmaniasis. Brit. J. Derm, 74: 127.

17. Rahim, G.F. and Tatar, 1967 - Oriental sore in Iraq. Bull. end. Dis 8.

18. Rahim, G.F. 1967 - Review of the present situation of leishmaniasis in Iraq (LEISH/INF/67.6).

19. Russel, A. & Russel, P. 1756 - The natural history of Aleppo, London Press. First Edit. p. 262.

20. Siage, J. 1967 - Reflexions sur la leishmaniose cutanee Dermatology, postgraduate seminar, Faculty of Medicine, American University of Beyrouth.

21. Tarkdji, A. 1936 - Le Bouton d'Orient en Syrie. Imprimerie moderne, Toulouse.

22. Trabaut. 1930 - Chronique sur le Bouton d'Alep. Rev. de Med. d'Hyg. Trop. No. 5.

23. Unat, E.K. 1967 - The present situation of leishmaniasis and its control in Turkey. WHO/LEISH/INF/67.7.

24. Villemin, A. 1854 - Rapport sur le bouton d'Alep. Gaz. med. de Paris, p. 200.

25. Volnay, 1787 - Voyage en Syrie et en Egypt. Paris, T. II., p. 410.

26. WHO/LEISH/67.3 - Leishmaniasis Reference List, 1890-1963.

27. WHO/LEISH/67.4 - Leishmaniasis Reference List , 1960-1966.

28. WHO/LEISH/68.7 - Inter-regional Travelling Seminar on Leishmaniasis.

LEISHMANIASIS AND PRIMARY HEALTH CARE IN TUNISIA

Ben-Ismail, R.*, Benammar, R.°, Ben-Rachid, M.S.*

Both visceral leishmaniasis (VL) and cutaneous leishmaniasis occur in Tunisia. The pattern of VL is of **classical infantile mediterranean kala azar**. Current annual incidence (1988) is about 120 reported cases. Almost all cases come from the north of Tunisia. However, new VL foci are presently arising in mid-Tunisia in areas where large water resources development projects have been recently completed. The causative parasite of VL is **Leishmania(L.) infanium** s.st, (zymodeme Lon 49, London = Mon 1, Montpellier). Dogs are a proven reservoir host. **Phlebotomus (P) perniciosus** is the suspected vector.

There are three forms of cutaneous leishmaniasis in Tunisia.

Zporadic CL is observed in the north in the VL foci and is caused by a variant of **L. infantum** (zym. Mon 24). About 20 cases are recorded every year. The vector and the reservoir hosts of SCL are unknown.

Zoonotic CL is widespread in the centre and the south of the country. Since 1982, an epidemic has spread rapidly from the governorate of Kalrouan to cover parts of 8 other governorates. More than 25,000 cases were reported since the beginning of the outbreaks. ZCL is caused by **L. major** (zym. Mon 25 = Lon 1). **Psammomys obesus, Meriones (M) showi** and **M. libycus** are proven reservoir hosts of ZCL in Tunisia and **P. papatasi** has been incriminated as a factor.

A Chronic CL form caused by **L. tropica** (zym. Mon 8, Syn. **L. killici**) is observed in the south-east of Tunisia (pre-Saharan zone). Its annual incidence is about 12 reported cases. The sporadic character of this particular form suggests the presence of an animal reservoir not yet identified. **P. sergenti** is the suspected vector of CCI.

ZCL and VL are considered as major public health problems in Tunisia. **The Basic Health Care** (BHC) **Division** plays an important role in their control and surveillance. Since the beginning of the ZCL epidemic, a system of case detection, registering, reporting and treatment was established at a peripheric level in the BHC

---

* Departement de Parasitologie, Faculté de Medecine, Tunis
° Direction des Soins de Santé de Base, Ministere de la Santé Publique, Tunis, Tunisie.

regional units. The implementation of this "sentinelle" structure that allowed follow-up of the spread of the epidemic, will be described. Field research on the transmission cycles and pilot projects are carried out by research institution workers in close collaboration with the BHC regional units' personnel. The Ministry of Agriculture is involved in the control of rodents. The contribution of these different sectors will be discussed.

PROTECTIVE IMMUNITY AGAINST LEISHMANIA DONOVANI IN BALB/c MICE

Suad Z. Jawadat, Nada K. Al-Hussayni and Layla Kh. Rifaat

Scientific Research Council, Biological Research Center,
Microbiology Department, Al-Jadiriya, Baghdad, Iraq

Abstract

A vaccine prepared from a live or sonicated promastigotes of non-human Leishmania sp. (isolated from *Sergentomya* *baghdadis* "IBAG/IQ/1982/Kal-Iraq") was used experimentally to protect Balb/c mice against visceral leishmaniasis.

Groups of mice were immunized with either sonicated or live promastigotes in Freund's complete adjuvant or in PBS and compared with control groups of immunized mice. Fifteen days later, mice were challenged with *Leishmania* *donovi* (MHOM/IQ/1982/BRC1). Challenged mice were rechallenged after 9 weeks. Throughout 14 weeks of observation, mice immunized with sonicated parasites or live promastigotes in adjuvant revealed no parasites in culture media or impression smears of liver and spleen after 11 and 14 weeks post-challenge, while 66% of mice immunized with antigens in PBS were free from infection and 100% of control mice were infected. At the same time delayed hypersensitivity response in each group was measured at 4, 11 and 14 weeks after challenge. Sera were examined for antibody titer by ELISA during weeks 3, 6 and 12. The present results suggest a method for immunization against visceral leishmaniasis.

Introduction

Visceral leishmaniasis is a disease of worldwide prevalence, mostly in tropical and semitropical countries. The disease results from parasitization of macrophages of the liver, spleen and reticuloendothelial system (1). For controlling the disease, drugs offer great hope but are still too costly or not good enough (2).

Prevention of infectious diseases by immunization has proven to be one of the most powerful and cost-effective weapons of modern and veterinary medicine (3). In the past decade, extraordinary advances have been made in the field of vaccination (4-6). Cosmetic vaccination against *L.* *major* or *L.* *tropica* is practised in some areas by inoculation with virulent organisms (4). Convit, *et* *al* (7) developed a vaccine strategy that could be used for immunotherapy of cutaneous leishmaniasis and compared it with the antimonial regimen in terms of cure rates (7). Such an approach, however, is not feasible with severe visceral leishmaniasis (kala-azar) (1). Holbrook et al (8) reported that immunity can be elicited against L. donovani by subcutaneous immunization of mice with killed promastigotes, but adjuvant enhancement is necessary. In the present work we demonstrate for the first time that immunization of mice with sonicated or liver promastigotes of non-human Leishmania is capable of inducing protective immunity to L. donovani.

Materials and Methods

A non-human Leishmania, IBAG/IQ/1982/Kal-Iraq (FM50, isolated from sandfly S. baghdadis), was used for immunization of mice. The parasites were kept as stabilites in liquid nitrogen and in biphasic medium. An Iraqi isolate of L. donovani MHOWM/IQ/1982/BRC1 (9) was used for infection experiments and for preparation of soluble antigen (SA) for immunological tests. It was maintained in vivo by serial passage in Balb/c mice and isolated and grown in biphasic medium at 25°C when required. The SA was prepared from each isolate as described by Rassam et al (10) and protein concentration was estimated by Warburg and Christiam method (11).

Six- to eight-week-old inbred male Balb/c mice were used throughout. Animals were immunized by a single intraperitoneal (IP) dose as follows:

Group 1 (g1) received 225 μg (protein) SA(FM50)/ml PBS, pH 7.3, (SA-PBS).

Group 2 (g2) received 225 μg (protein) SA(FM50)/ml PBS-adjuvant emulsion at a ratio of 9 PBS/1 Freund's complete adjuvant (FCA), (SA-FCA).

Group 3 (g3) received $5x10^6$ live promastigotes (FM50)/ml PBS, (P-PBS).

Group 4 (g4) received $5x10^6$ live promastigotes (FM50)/ml FCA emulsion, (P-FCA).

Group 5 (g5) received $5x10^6$ live promastigotes (BRC1)/ml PBS and served as the infected control.

Group 6 (g6) received PBS only (normal control).

Experiments were repeated three times.

Experiment one: Groups 1-4 (3 animals/group) were immunized with non-human isolate.

Experiment two: Groups 1-4 (6 animals/group) were immunized as in experiments one and challenged 15 days later, intracardially with $5x10^6$ promastigotes (BRC1).

Experiment three: Groups 1-4 (6 animals/group) were immunized and challenged as in experiment two then rechallenged intracardially or intramuscularly with $5x10^6$ parasites (BRC1)/ml per animal, 9 weeks after challenge.

Delayed hypersensitivity response (DHR) was estimated in the three experiments by measuring footpad swelling with a verniercaliper 24 hours after subcutaneous injection in the right footpad of 50 mg (protein) SA (BRC1) in 0.1 ml FCA-PBS. The left footpad served as control and was injected with 0.1 ml FCA-B. The experiments were done at 4, 11 and 14 weeks post challenge.

Antibody level was estimated by the indirect micro-ELISA (2) using 10 μg SA (BRC1)/ml for coating the plates. Filter paper discs of dried blood samples (5 mm diameter) were soaked in 1.5 ml incubation buffer (pH 7.3) for 1 hour to give an approximate serum dilution of 1/500. Horse radish peroxidase conjugated to rabbit antimouse 1gG was purchased from Sigma Laboratories and used at a dilution of 1/400. The substrate (O-phenylene diamine) was allowed to react for 45 min. and the reaction was stopped with 0.8 NH_2SO_4. Absorbency was read by the Micro-ELISA minireader MR 590 (Dynatech) at 490 nm. The experiments were done at 3, 6 and 12 weeks post challenge.

Results

In the present study we investigated whether protective immunity could be achieved with FM50 promastigotes (sonicated or alive) and detected by hetrologous challenge with L. donovani.

To study the course of systemic disease, culture and impression smears were done of spleen and liver biopsies, 11 and 14 weeks post-challenge (Table 1) to search for the presence of promastigotes and amastigotes respectively. Microscopic examination revealed no infection of immunized animals in groups 1-4 (experiment 2). Upon rechallenge, only mice immunized in presence of adjuvant were fully protected (g2 and g4) while g1 and g3 which were immunized without adjuvant revealed 66% protection; challenge animals when rechallenged intracardially showed positive smear and culture (data not show), while intramuscular rechallenge resulted in negative culture and the appearance of few extracellular parasites in the smears.

Spleen weight was measured in the second and third experiment. Weights were either unchanged or slightly increased and results were insignificant in comparison with both control groups.

Table 1. Challenge of mice with *L. donovani* after immunization with FM50 antigens; values are expressed as number of animals with positive cultures and/or smears per number of animals tested.

	Experiment-2 (Challenged mice)				Experiment-3 (Challenged & rechallenged mice)[1]			
Immunizing agents	Liver & Spleen 11 weeks		14 weeks		14 weeks			
					Liver		Spleen	
	C[2] &	S[3]	C &	S	C &	S	C &	S
SA-PBS	0/6	0/6	0/6	0/6	0/6	0/6	0/6	2/6
SA-FCA	0/6	0/6	0/6	0/6	0/6	0/6	0/6	0/6
P-PBS	0/6	0/6	0/6	0/6	0/6	0/6	0/6	2/6
P-FCA	0/6	0/6	0/6	0/6	0/6	0/6	0/6	0/6
Unimmunized infected	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6

1 - Mice were rechallenged intramuscularly, (or intracardially; data not shown). 2 - C = Culture. 3- S = Smear.

Delayed hypersensitivity in immunized animals after 11 weeks was significantly elevated compared to the normal control, (Table 2). After 14 weeks, however, only g2 and g4, which were immunized in the presence of adjuvant gave significant DTH (Table 2). Although footpad swelling appeared in groups immunized with SA-PBS or P-PBS, the differences were not significant when compared to the normal control.

In the second experiment, groups of mice were immunized and challenged as shown in Table 3. At week 4 and 11 post challenge, all groups revealed significant DTH in comparison with both control groups. At week 14 post challenge all groups revealed significant DTH only in comparison with normal controls.

In the third experiment, groups of mice were immunized, challenged and rechallenged as shown in Table 4. Immunized mice developed typical footpad swelling when compared with the normal

Table 2. Footpad swelling test in Balb/c mice immunized with non-human Leishmania (FM50) antigens. Each group comprises 3 animals. Values are mean swelling thickness ± SEM (in mm)*.

Immunizing agent	Time (weeks) after immunization	
	11	14
SA-PBS	1.46 ± 0.17 (P= 0.002)	0.53 ± 0.17 (P= 0.1)
SA-FCA	1.26 ± 0.03 (P+ 0.001)	0.60 ± 0.37 (P= 0.2)
P-PBS	0.73 ± 0.05 (P= 0.01)	0.63 ± 0.08 (P= 0.1)
P-FCA	0.60 ± 0.05 (P= 0.001)	1.00 ± 0.45 (P= 0.01)
Normal control	0.13 ± 0.03	0.20 ± 0.05

* Values are given as differences between right footpad swelling (test) and left footpad swelling (control). Each treatment is compared statistically with normal control.

controls. At week 4, 11 and 14 post challenge, all groups revealed significant DTH in comparison with normal controls. Comparison with in immunized infected mice showed significant differences at week 4 only for groups immunized in the presence of adjuvant (g2 and g4). At weeks 11 and 14, all significant values were at different levels (Table 4).

To detect humoral immunity, ELISA was applied; the levels of anti-*L. donovani* IgG antibodies in immunized animals (first experiment) were similar to the normal control (i.e. had low specific igG levels) at weeks 3, 6 and 12. After challenge (second experiment) the levels of antibodies also were low among mice immunized with adjuvant (g2 and g4), in comparison with unimmunized infected and normal controls (p = 0.05). In the third experiment (immunized, challenged and rechallenged mice), the levels of antibodies were low and insignificant four weeks post challenge in comparison with both control groups. At 6 weeks pos challenge, comparison with both control groups showed significant differences for groups immunized in the presence of adjuvant only SA-FCA or P-FCA (P = 0.001 and P = 0.001 respectively), but differences were not significant with groups immunized without adjuvant (P = 0.1). The significant differences at week 12 upon immunization compared with both control groups were: with SA-FCA (P = 0.05), P-FCA (P = 0.01), SA-PBS and P-PBS (P = 0.001 and 0.001 respectively).

Table 3. Footpad swelling test in Balb/c mice immunized with FM50 antigens, and challenged with *L. donovani*. Each group comprises 6 animals. Values are mean swelling thickness ± SEM (in mm)*.

Immunization agents	Time (weeks) after immunization					
	4		11		14	
SA-PBS	0.80 ± 0.05	(P= 0.001)[1] (P= 0.001)[2]	1.08 ± 0.05	(P= 0.001)[1] (P= 0.001)[2]	1.6 ± 0.18	(P=>0.1)[1] (P=>0.001)[2]
SA-FCA	1.30 ± 0.15	(P= 0.001)[1] (P= 0.001)[2]	1.55 ± 0.14	(P= 0.001)[1] (P= 0.001)[2]	1.30 ± 0.21	(P=>0.1)[1] (P=0.001)[2]
P-PBS	1.30 ± 0.09	(P= 0.001)[1] (P= 0.001)[2]	1.30 ± 0.14	(P= 0.001)[1] (P= 0.001)[2]	1.6 ± 0.13	(P=>0.1)[1] (P=<0.001)[2]
P-FCA	1.08 ± 0.07	(P= 0.001)[1] (P= 0.001)[2]	0.97 ± 0.02	(P= 0.001)[1] (P= 0.001)[2]	1.15 ± 0.02	(P=>0.1)[1] (P= 0.001)[2]
Unimmunized[1] infected	0.13 ± 0.04		0.30 ± 0.00		0.80 ± 0.13	
Normal[2] control	0.13 ± 0.05		0.02 ± 0.00		0.12 ± 0.03	

* Values are given as differences between right footpad swelling (test) and left footpad swelling (control). Each treatment is compared statistically with 1- unimmunized infected and 2- normal control.

Table 4. Footpad swelling test in Balb/c mice immunized with FM50 antigens, and challenged with *L. donovani*, and rechallenged with 5x10^6/ml promastigotes of *L. donovani* at the 9th week post challenge. Each group comprises 6 animals. Values are mean swelling thickness ± SEM (in mm)*.

Immunization agents	Time (weeks) after immunization 4		11		14	
SA-PBS	0.85 ± 0.13	(P= 0.1)^1 (P= 0.05)^2	1.3 ± 0.23	(P= 0.05)^1 (P= 0.001)^2	1.13 ± 0.17	(P= 0.002)^1 (P= 0.001)^2
SA-FCA	1.86 ± 0.20	(P= 0.05)^1 (P= 0.01)^2	2.03 ± 0.79	(P= 0.001)^1 (P= 0.001)^2	1.18 ± 0.19	(P= 0.2)^1 (P= 0.001)^2
P-PBS	1.36 ± 0.58	(P= 0.05)^1 (P= 0.05)^2	1.00 ± 0.15	(P= 0.02)^1 (P= 0.001)^2	1.48 ± 0.12	(P= 0.001)^1 (P= 0.001)^2
P-FCA	1.20 ± 0.09	(P= 0.001)^1 (P= 0.001)^2	1.98 ± 0.13	(P= 0.001)^1 (P= 0.001)^2	1.43 ± 0.14	(P= 0.001)^1 (P= 0.001)^2
Unimmunized^1 infected	0.41 ± 0.08		0.33 ± 0.15		0.38 ± 0.13	
Normal^2 control	0.10 ± 0.02		0.20 ± 0.07		0.17 ± 0.08	

* Values are given as differences between right footpad swelling (test) and left footpad swelling (control). Each treatment is compared statistically with 1- unimmunized infected and 2- normal control.

Discussion

Examination of culture media and impression smears of liver and spleen of mice immunized with SA-FCA and P-FCA revealed no parasites. Mice treated with SA-PBS or P-PBS showed few single extracellular parasites, and those failed to initiate infection in culture media. This observation suggests that there was enhanced killing or suppression of amastigote proliferation. It may be speculation that agents such as sensitized lymphocytes process soluble factor(s), thereby fostering the development of an immune response. These results are in accordance with results of Murray *et al* (12) who mentioned that lymphocyte activity indicates the ability to generate macrophage-activating lymphokines and is a key determinant of acquired cellular resistance to *L. donovani*. *In vitro* study by Tanner and Oliver (13) indicated that *L. donovani* infections can be cured by interleukin 2 produced by activated spleen cells. Indeed, Dhaliwal and Liew (14) reported that T-cells from mice recovered from *L. major* infection are capable of elaborating gamma interferon, a macrophage-activating factor which enables infected macrophages to eliminate intercellular parasites.

In the present study inhibition of parasite growth associated with DTH, after immunization with various immune agents, provides evidence of mounting protective immunity development against *L. donovani* infection. These results are in agreement with those of Rezai *et al* (15), De Tolla *et al* (16) and Smrkovski (17).

The humoral immune response of mice protected against *L. donovani* was compared with both control groups. Immunization with all immune agents induced low levels of specific antibodies in the absence of challenge. After challenge and rechallenge with *L. donovani*, results showed variable levels of antibodies; when Krettle and Brener (18) dealt with *Trypanosoma cruzi* infection, they stated that specific antibodies play an important role in the *in vivo* expression of resistance against infection. It is possible that some of these specific antibodies, including the so-called "lytic antibodies" involved in complement-mediated lysis of parasites, become involved in protection. It is possible that higher levels of specific antibodies observed in the present work contributed caused the second arm to protection against visceral leishmanial infection.

In conclusion, the present study demonstrated that non-human leishmanial antigens enhance Balb/c mice resistance (humoral and cellular immunity) to visceral leishmaniasis giving possibly long-lasting immunity. The results suggest a method for immunization against *L. donovani*, and work is in progress to test the potential use of non-human *Leishmania* as immune agents against the cutaneous diseases.

Acknowledgment

We wish to express our sincere thanks to Dr. Maysoon B. Rassam who read the draft; also, we appreciate the statistical analysis assistance by Miss Hana S. Ali.

References

1. Tuckerman, A. and Lainson, R. Leishmania in "Parasitic protozoa" 57-133 vol. 1 (Ed. Kreier, J.P.) Academic Press, New York, 1977.

2. Jawdat, S.Z., Wahid, F.N., Al-Barazanji, H.A., Rifaat, L.K.H. and Rutha, K.Y. Detection of circulating antibodies to visceral leishmaniasis following treatment. J. Biol. Sci. Research, 16(2): 259-271, 1985.

3. Williams, J.F. Prospects for prophylaxis of parasitism (711-719). International J. for parasitology (Vol. 17 (2): 711-719, 1987. Proceeding of the Sixth International Congress of Parasitology, Brisbane, Australia, 24-29 August 1986.

4. Greenblat, C.L. The present and future of vaccination for cutaneous leishmaniasis. In: Mzrahi, A., Herman, I., Klinberg, M.A., et al. New developments with human vaccines. New York: Liss: 259-285, 1980.

5. Mayrink, W., Williams, P., Dacosta, C.A., et al. An experimental vaccine against American dermal leishmaniasis: Experience in the State of Espirito Santo, Brazil. Am. Trop. Med. Parasitol., 79: 259-269, 1985.

6. Alexander, J. & Russel, D.G. Parasite antigens-their role in protection diagnosis and escape: the leishmaniasis. Current. Trop. Microb. Immunol. 43: 67-120, 1985.

7. Convit, J., Rondon, A., Vlrich, M., et al. Immunotherapy versus chemotherapy in localised cutaneous leishmaniasis. Lancet, No 8530: 401-404, 1987.

8. Holbrook, T.W. and Cook, T.A. Immunization of mice against Leishmania donovani by subcutaneous injections of dead promastigotes. Am. J. Trop. Med. and Hyg. 32(1): 51-53, 1983.

9. Al-Hussayni, N.K., Rassam, M.B., Jawdat, S.Z. and Wahid, F.N. Numerical taxonomy of some Old World Leishmania species. Tras. Roy. Soci. Trop. Med. and Hyg. 81: 581-586, 1987.

10. Rassam, M.B., Al-Saad, M.R., Jawdat, S.Z., Rifaat, L.K.H. and Al-Hussayni, N.K. Gel filtration of Leishmania donovani soluble antigens I. Biochemical characteristics and serological activity. J. Biolo. Sci. Research 17(2): 119-139, 1986.

11. Warburg, O. & Christian, W. In Data for Biochemical Research, (ed. R.M. Dawson, W.H., Elliot, D.C., Elliot and Jones, K.M.), 2nd ed, pp. 625-6, 1941.

12. Murray, H., Masur, H. and Kelthly, J.S. Cell mediated immune response in experimental visceral leishmaniasis. II Oxygen-dependent killing of intracellular L. donovani amastigotes. J. Immunol., 129: 343-350, 1982.

13. Tanner, C.E. and Olivier, M. Experimental visceral leishmaniasis: Immunotherapy with IL 2- activated spleen cells. International Congress Series No. 810 p. 251 Abstract. ISBN 0444810277 Elseiver Sci. Publishers B.V. Netherlands, 1988.

14. Dhaliwal, J.S. and Liew, F.Y. Induction of Delayed-Type Hypersensitivity to Leishmani major and the concomitant acceleration of disease development in progressive marine cutaneous leishmaniasis. Infection Immunity, 55(3): 645-651, 1987.

15. Rezai, H., Farell, J. and Soulsby, E.L. Immunological responses of L. donovani infection in mice and significance of T-cell resistance to experimental leishmaniasis. Clin. Exp. Immunol. 40: 508-514, 1980.

16. De Tolla, L.J., Semprevivo, L.N.H., Palczuk, N.C. and Passmore, H.C. Genetic control of acquired resistance to visceral leishmaniasis in mice - Immunogenetics 10: 353-361, 1980.

17. Smrkovski, L.L., Larson, C.L. and Reed, S.G. Effect of visceral leishmaniasis on congenitally athymic mice. Infect. Immun., 25: 1078-1080, 1979.

18. Krettli, A.U. and Brener, Z. Resistance against Trypanosoma cruzi infection associated to anti-living trypomastigotes antibodies. J. Immunol., 12: 2009-2012, 1982.

EPIDEMIOLOGICAL FACTS ON KALA-AZAR
(VISCERAL LEISHMANIASIS) IN IRAQ

Amjad D., Niazi*, Suad Z. Jawdat, Layla Kh. Rifaat****

and Hana S. Ali**

Visceral leishmaniasis (VL), in which the parasites affect the internal organs (spleen, liver, bone marrow, etc.), is usually fatal if untreated (1). It is endemic in several parts of Africa, the Indian subcontinent and Latin America, and occurs sporadically in China, the Mediterranean Basin, South West Asia and southern parts of the Soviet Union (1).

In Iraq VL is regarded as an endemic disease. The first report on the disease was recorded in 1916. Several hundred cases of VL are reported in Iraq annually (3). The incidence of the disease is higher in the central provinces than in the south or in the north (4, 5, 6, 7 and 8).

The present investigation was designed to detect magnitude of exposure to the infection and to find different types of reaction to it.

Materials and Methods

The present work depends on some particular parameters.

1) Charts and case sheets

Charts and case sheets were designed and used to collect data from hospitals and houses. There were three teams, one visiting the hospitals, another visiting the patients homes, and a third performing the laboratory work.

Information was collected from the hospital in regard to name, sex, sequence of the child in the family, weight, parent background, time lapse between beginning of symptoms and admission to hospital, signs and symptoms, clinical examination and blood sampling, treatment outcome; and from the home, level of income, particulars

---

* Institute of Endemic Disease, Ministry of Health, Baghdad, Iraq.

** Department of Microbiology, Biological Research Centre, Scientific Research Council, Jadiriyah, Baghdad, Iraq.

regarding children, age of mother and blood sampling of all those previously mentioned (Tables 1, 2 and 3). Another 100 control blood samples were collected from school children far away from the endemic area (Baghdad city, Al-Karrada) and processed in an identical way.

2) Home visits

The team that homes related certain criteria to such categories as levels of income, literacy of either or both parents, occupation of father, type of dwelling and crowding index, and estimated income of the family.

The homes of 57 sick children were visited and blood samples were taken from the sick children, their sisters and brothers of the same age group, and children of relatives and neighbours.

3) Enzyme Linked Immunosorbent Assay (ELISA)

The indirect method of the micro-ELISA was followed as described by Niazi (7), using L. donovani (BRCI) soluble antigen extract. The antigen was used for coating the ELISA micro-titer plates at a protein concentration of 10 μg/ml. Titration was done with known controls, both positives and negatives, and took the 0.3 reading as a cut point for positives; micro-ELISA values were obtained by micro-ELISA minireader MR (Dynatech product) at 490 nm.

4) Indirect Fluorescent Antibody Test (IFAT)

This was performed on individuals with suspected cases using L. donovani as the antigen, and was done by the Institute of Endemic Disease, Kala-azar Section.

5) Diagnosis

Criteria have been used to diagnose a case of Kala-azar on clinical, serological, and whenever possible on bone-marrow basis.

6) Tri-coloured arm strip

A method of measuring the arm, which called for a tri-coloured arm strip (9), was used to determine under-nutrition in studied cases.

In addition, weighing scales were used to weigh every sick child and compare the weight and age to the standards mentioned in the growth start adapted by the Maternal and child Health Clinics (9).

Results

From the analysis of the data collected after tabulation (Tables 1 and 3), the information was collected from 238 hospitalized cases of kala-azar; 57 houses were visited and the other children of the same family examined. Children of close relatives and children of neighbours (307 in all) and 37 mothers were also examined.

From (Table 1), it is clear that the situation had not changed much of the previous picture of the disease.

It seams from the present work that the high fatality is among a small and narrow group of children which show severe clinical forms of the disease, especially those cases in which we found a long time lag between suffering and admission to hospital (where delayed hypersensitivity reaction did not develop) or those showing recurring signs for the same reason.

Geographical distribution of cases

We found that all the cases came from the known foci of the disease.

Weight of children

Adapting the growth chart it was found that 33.8% of children admitted to hospitals were below average normal standard, 60.6% were within the range of normal weight, and only 5.6% were above range (Total: 216).

Sequence of birth in the family

It was found that generally less than 205 (19.4%) were the first born, and about 65% were the third or more, as shown in Table 2.

Feeding

It was found that, among 183 cases, 45 (29.5%) children were artificially fed and 129 (69.3%) were breast fed.

Table 1. Distribution of 238 cases studied according to sex and age

Age in years	Sex male	female	Total	% to Total
< 1	60	58	118	49.6
1 < 2	44	38	82	34.9
2 < 3	8	11	19	7.98
3 < 4	4	2	6	2.5
4 < 5	--	2	2	0.8
5 < 6	2	1	3	1.25
6 < 7	--	--	--	--
7 < 8	2	1	3	1.25
8 < 9	1	--	1	0.4
9 < 10	1	--	1	0.4
10 < 11	--	1	1	0.4
11 < 12	1	1	2	0.8
Total	123	115	238	
%	51.6%	48.4%		

Table 2. Sequence of birth of the child among the children of the family

Sequence of the child	Number	Percent
1	44	19.4
2	39	17.2
3	35	15.4
4	20	8.8
5	21	9.3
6	18	7.9
7	18	7.9
8	10	4.4
9	12	5.3
10	3	1.3
11	2	0.9
12	4	1.8
15	1	0.45
	227	

Background of the family

174 (73.4%) out of 238 cases of kala-azar were born to illiterate.

Time lapse between feeling and showing signs and symptoms and reporting to hospitals as ill in 224 cases was studied. The time ranged from one day to nine months with a mean of 37.2 days. This was considered a long time compared to admissions of other diseases. This of course depends on the well known variation in the severity of the signs and symptoms.

Among 187 cases examined by ELISA and IFAT it was found that 146 (78.1%) gave both positive results or gave both negative results and only 41 (21.9%) was there disagreement either way.

With regard to ELISA, bone marrow smear or culture positively, it was found that, among 45 cases examined, 39 (86.7%) showed agreement in the results, and only 6 (13.3%) gave negative results. Of 207 cases 193 (93.2%) were found to be ELISA positive and only 14 (6.8%) were found negative by ELISA.

Of 213 cases, 161 (75.6%) were found IFAT positive and 52 (24.4%) were found IFAT negative.

According to the present criteria we found that 54 (94.5%) of the families of sick children visited at their houses were of medium socio-economic level.

Three hundred and seven blood samples were collected including those from the sick children (250 excluding the sick). Of those 250 samples, 8 (3.2%) were previous cases of kala-azar and they were still positives, while 4 (1.6%) were previously infected with kala-azar but were now negative. Sixty-three (25.2%) were positive but did not show any signs or symptoms. Prevalence of positivity among all children during time of visits are shown in (Table 3).

Forty-one point six per cent (41.6%) of children were therefore positive during the visit, i.e., about half of the children were positive all the year around, both in number and in titre, and age distribution was similar to the recorded cases.

Of the mothers of the 57 cases visited at their houses, 37 had blood samples taken. Twenty-one (56.8%) were found to be positive and only 16 (43.2%) were found to be negative.

All of 100 blood samples collected from the non-endemic areas were serologically negative.

Table 3. Particulars of children examined during house visits

	No.	%
Cases	57	18.6
Previous cases still positive	8	2.6
Previous cases now negative	4	1.3
Symptomless cases	63	20.5
Negative children	175	57
Total	307	

Discussion

Distribution of cases according to age was found, 495 being under one year of age, and 96% under 5 years of age. These results were in agreement with the Sukker report (3). The same is true of the asymptomatic cases, which confirms the view of early high exposure of the children to the disease, differing only in that the manifestation of the signs and symptoms and admission to the hospital by a small number took some time, according to the severity of the disease. Those cases constitute the confirmed cases of kala-azar which represent only 44.5% of the positive sero reactors among the delimited age group of children in those communities. Moreover, about 41.6% of all the children examined during the visits were positive (including the cases). It means that seropositivity is present at any time of the year, both in titre as mentioned by Jawdat et al. (8), and in number greatly exceeding those reported to the hospitals; and that those cases reported to the hospital represent a small number of the positive cases where signs and symptoms develop, since for some reason or another the delayed hypersensitivity and the cellular immunity which mark the cure of the cases takes a longer time to appear in these cases.

Among the seropositive children, both sick and asymptomatic, a high percentage (30%) were found to be artificially fed, and 34% were found to be below normal average standard weights. As for the sequence of the child in the family, 65% were recorded as the third child or later. This could explain nutritional factors that may affect the course of the disease. This is closely related to the critical age of the child nutritionally, especially with ignorant and illiterate mothers (73.4%).

Conclusions

The work which has been done has led us to conclude the following points, which we think are important in the diagnosis, epidemiology and control of the disease.

1. It was found that the ELISA technique used in diagnosing the cases was more sensitive than IFAT.
2. The children in affected areas and foci are exposed to the disease early in their life.
3. Not all the children infected report to the hospitals.
4. A high number of positivity is present among the children at any time of the year.
5. A high percentage of sick children (both symptomatic and asymptomatic) were found to be artificially fed, and below normal average standard weights.
6. A very high percentage 73.4% of the all positives have illiterate mothers.
7. The preceding factors, plus the fact that the children highly affected belong to the critical age group nutritionally speaking, in relation to weaning and the beginning of self feeding constitute the main reasons for the distribution of the cases according to age.

Acknowledgments

This work was financed by the Biological Research Center and Health Education and Research. The authors also express their thanks to Miss N. Abdul Abbass and Mr. Hisham M. Latif for field work assistance.

References

1. The leishmaniasis. Tropical Disease Research, Seventh Programme Report. December, 1984. W.H.O., Geneva, 1985.
2. Kulz, L. Pathologische aus therapeutische Beobachtunger aus Niedermedsopatamien. Archiv fur Schiffs-und Tropenhygiene, 20: 487-502, 1916.
3. Sukkar, F. Report in the epidemiology of kala-azar L. infantum in Iraq. Endemic Disease Institute, Kala-azar Section, 1982.

4. Nour, L. and Al-Jeboori, T.I. Kala-azar in Iraq. An epidemiological and clinical study. J. Fac. Med. Baghdad, 15: 72-85, 1976.

5. Sukker, F. Some epidemiological and clinical study. J. Fac. Med. Baghdad, 17: 53-62, 1976.

6. Al-Alousi, T.I., Latif, B.M.A. and Al-Shenawi, F.M. Detection of antibodies of leishmaniasis in dried blood on filter paper by the indirect fluorescent antibody test, Ann. Trop. Med. Parasito., 74: 505-506, 1980.

7. Niazi, A.D. Studies in the epidemiology and sero-epidemiology of visceral leishmaniasis in Iraq. Ph.D. these, University of London, 1980.

8. Jawdat, S.Z., Wahid, N.F., Al-Barazanji, H.A. and Rifaat, L. Kh. Detection of circluating antibodies to visceral leishmaniasis following treatment. J. Biol. Sci. Res. 16(2): 259-271, 1985.

9. Epi/Stros/PHW/83/TM1/Rev.2.

TREATMENT OF LEISHMANIASIS

Prof. Mohamed Amer M.D.

Zazagig University Egypt

Why Treat Leishmaniasis?

Considering that 90% of primary lesions of cutaneous leishmaniasis heal spontaneously anyway and that recovering is supposed to confer lifelong immunity, this could be a pertinent question to ask.

In old world cutaneous leishmaniasis treatment is desired when there are lesions on exposed parts of the body especially on the face, the healed scars and areas of depigmentation are ugly, another reason to treat is to prevent the 10% of cases that don't heal from progressing to one of the chronic forms.

Infection with L. aethiopica should receive special attention since they involve large areas of the body surface and tend to have a long course. Healing of these lesions gives rise to severe fibrosis that, for example may restrict the use of fingers (5).

According to Marinkelle (20), another important reason for the need to treat is that is one of the most important methods of controlling the disease in the population.

Traditional Therapies

1. The current textbook method of treating new world cutaneous and mucocutaneous leishmaniasis but not L. aethiopica infection is with a pentavalent antimonials. The drugs of choice are; sodium stibogluconate and N-methylglucamine antimonate. There are various recommended dosage regimes, Bulter (6), recommended a dose of 0.1 ml of a 34% solution of the drug/kg body weight/day for 14 days. The course can be repeated after a 14 days interval, the drug can be given by intravenous of intramuscular routes.

   A large number of side effects including nausea, vomiting, diarrhea, skin rashes, headache and dizziness are associated with these drugs. More importantly, the drugs are toxic to the liver, kidney and heart (15).

The mechanism of action is unclear, numerous enzymes of the parasite are inhibited selectively, of significance; phosphofructokinase which catalyses a rate limiting step of glycolysis is inhibited, in the way production of adenosine triphosphate may be blocked (12).

2. For mucocutaneous leishmaniasis, the second line of treatment is with amphotericin B, this is a toxic antibiotic used parenterally for treating systemic fungal infections. The drug should be diluted in 5% dextrose solution and given 1 mg/kg over 6 hours on alternate days. Amphotericin B is very toxic to the kidney, urea and urine protein levels should be carefully monitored. Patients often complain of fever, chills, headache, nausea and nasal swelling. Details of mechanism of action of amphotericin are not clear, it is thought to act through interaction with ergosterol in leishmania membranes.

3. Both amphotericin B and pentamidine can be used as second line drugs to treat cutaneous leishmaniasis but the severe toxic side effects should be considered, pentamidicine, an aromatic diamidine is given intramuscularly at about 4 mg/kg/day for 14 days. Beside causing vomiting, hypotension and tachycardia, it is also toxic to the liver, kidney and pancreas (15).

Infections with L. aethiopica pose a special problem because they are refractory to the normal regimens of antimonials which may be effective only in high doses, as stated by Bryceson (5), he recommended pentamidine or amphotricin B for such infections. Treatment must be prolonged even after apparent elimination of parasites as relapses have been observed up to 15 months later. Bryceson (5) also made the interesting observation that before the patients are finally cured, they relapse in a form that has a turbeculoid histology and convert to leishmanin positive from a previously negative state, chemotherapy is usually unsuccessful until this conversion.

Chulay (7) however, recommended using high doses of sodium stibogluconate to treat L. aethiopica up to 40 mg/kg/day.

Drugs That Are Used For Other Conditions:

1. Ketoconazole is a new imidazole derivative which is used for antifungal therapy, it was reported in sporadic trials to be effective in vitro (3) and in vivo (18) in leishmaniasis. In one study ketoconazole was effective and curative in about 70% of L. major cases after 4-6 weeks of treatment with 200-400 mg daily, no connection

was found between the duration of treatment, number or size of lesions and the rate of treatment. There seemed also to be no relationship between the cure rate and the time after infection that the treatment was started.

No side effects of ketoconazole have been reported by the patients, monitoring of liver function tests is required prior to and a regular 2 weeks intervals during treatment (2).

In another study cutaneous leishmaniasis has been successfully treated by ketoconazole with permanent cure in all cases except in a small proportion (5.9%), in comparison with cases treated with rifampicin it is clearly evident that ketoconazole is a highly effective and safe drug in treatment of cutaneous leishmaniasis (1). Ketoconazole antileishmanial activity was remarkably uniform against L. braziliensis and L. tropica, but Abdel Aal et al (1), found no difference has been observed between the response of cases getting their infection in any of the endemic Arabic countries (Saudi Arabia, Iraq and Jordan).

2. Metronidazole (Flagyl) is used for treatment of amaebiasis and trichomoniasis, it is also used for leishmaniasis, its selective toxity is probably due to reduction of nitro group on the drug inside the parasite. Clinical cure of leishmaniasis has been reported by Bassiouny (2), after the use of metronidazole, the earlier reported success could be accounted for by spontaneous cure, it appeared now that it is unlikely to play a primary role in the therapy for leishmaniasis.

3. Nifurtimox is the drug of choice in American trypanmosomaisis (chagas disease), with a dosage of 10 mg/kg/day for 30 days, clinical cure in 6 of 13 new world cutaneous leishmaniasis cases but only 2 of 13 mucocutaneous cases (21). At a dose level of 8-10 mg/kg/day for 120 days, nifurtimox was found to achieve clinical healing of cutaneous leishmaniais in 5 of 8 patients, and in 6 of 10 patients on 20 mg/kg/day for 10 days (11). Side effects were more common and more severe when the higher doses were used, these include anorexia, weight loss, insomnia and personality changes.

4. Rifampicin, in one of the earlier trials with rifampicin in Middle East using 600 mg/kg/day, clinical cure was reported in 4-16 weeks, in 9 of 13 patients with cutaneous leishmaniasis (13) Rifampicin was tried with other drugs in combination, Peters et al. (25) reported a case of successful treatment of L. mexicana amazonensis

diffuse cutaneous leishmaniasis with rifampicin and isoniazid but showed limited therapeutic action against L. aethiopica compared with pendamidine which still remains the drug of choice for initial therapy of diffuse cutaneous leishmaniasis.

Some therapeutic effect of rifampin/isoniazid may be expected in patients with very mild parasite load (some scanty parasites in the skin biopsy but no parasites in the skin smear) (28).

5. 8-Aminoquinoline is found to have exceptional efficacy in the L. donovani hamster model of visceral leishmaniasis as reported by Kimmamonk et al. (19), but no convincing clinical trials have been reported. Dihydroemetine and emetine was for leishmaniasis by some authors, Cohen (8), reports adding emetine to steroids to treat chronic leishmaniasis.

6. Levamisole, an antihelmenthic drug, can be used for leishmania as well, its use is dependant on a separate property of the drug which is its potentiating effect on T cells. Bulter (6), observed that even in an endemic area the prevalence of cutaneous leishmaniasis is low, probably due to inoculation with the parasite in early life by sandflies which leads to subclinical infections and long term immunity, he proposes that clinical disease in late life is due to declining cell mediated immunity which can be potentiated by levamisok, in his trial 28 patients were cured with levamisole only, but his proposal requires further investigation.

7. Furazolidine, Berman and Lee (3), reported a high antileishmanial activity of furazolidine against amastigotes in human macrophages. In vitro it was found to be more effective than nifurtimox (11).

8. Phenothiazines which are psychoactive drugs for psychiatric disorders, were found to have antileishmanial and antitrypanosomal activity. Henriksen and Lenden (14), treated 3 patients with L. aethiopica diffuse cutaneous leishmaniasis with topical chlorpromazine, inflammation was improved and parasites smears were after one month of treatment. Although this method of treatment is attractive, its efficacy has to be investigated further. However scars and skin discolouration were not altered and it is important that treatment is started early (21).

9. Allopurinol which is used in hyperuricaemia is observed to prevent growth of leishmania and Trypansoma cruzi in vitro. It also augments the antileishmanial effects of sodium stibogluconate in vitro. Allopurinol was successful in curing 6 of 10 patients with visceral leishmaniasis who has failed with sodium stibogluconate (17).

Rational Approaches For Better Antileishmanial Agents:

1. Difluromethylornithine (DFMO) inhibit growth of leishmania by blocking polyamine synthesis through inhibiting ornithine decarboxylase essential for polyamine synthesis (22).
2. Antipain and leupeptin, the peptide analogues, lead to inhibition of cysteine proteinases, and stop the in vitro multiplication of the parasite (9).
3. Clomipramine inhibits the H+ATP in the membrane of the parasites leading to disruption of the parasite surface membrane proton electrochemical gradient (28).
4. Transfer factor is a dialysable extract of leucocytes obtained from healthy donors who have recovered from cutaneous leishmaniasis. This factor is injected subcutaneously near the skin lesion of the patient (15).

Treatment of Leishmaniasis Recidivans:

Many of the drug therapies that are effective for cutaneous leishmaniasis are less effective for leishmaniasis recidivans, it is believed that this is due to, in part, the structure of the tuberculoid lesions. These have a dense cellular infiltrate and later dense scar tissue, surrounding small islands of the parasites, these pockets are not penetrable by the drug (15).

Steroids have been injected near or at the lesion to shift the hypernergic activity towards a normogenic response (8). This treatment is very painful, Cohen (8), reported adding emetine to steroids to treat a case that failed with amphotricin B.

Non Medical Treatment of Leishmaniasis:

Plastic surgery has had an important role to play in treating disfiguring scars especially scars of leishmaniasis recidivans, in these cases the patients already would have received medical treatment for some time, Currie (10), treated 78 lesions in 50 patients by surgical curettage under local anaesthetic, there were 73 success with wound healing within 4 weeks. Surgical treatment is quick, cheap and simple with few side effects and in simple cases, it requires only one or two visits to the clinic (15).

Leishmania organism are very thermo sensitive, both heat and cold treatment have been tried. Local heat treatment was tested and found effective in 3 patients with diffuse leishmaniasis, a water bath with circulating water through a pad wrapped around the lesion provided a temperature of 39°C to 41°C for a cumulative time of at least 20 hours over a period of several days, beneficial effect documented by pre and post treatment biopsies and cultures, but several other patients with ordinary cutaneous leishmaniasis did not respond to the same form of treatment. It was concluded that different strains and/or species of leishmania vary in their sensitivity to elevated temperatures (23).

Cold treatment has an advantage over heat treatment in that it tends to cause less inflammation to the surrounding tissues. Bassiouny (2), reported the successful treatment of 30 south American patients using cryotherapy with carbon dioxide cryomachine, the cosmetic result is good, there is little scaring because cryotherapy leaves an intact collagenous framework.

Cryotherapy is simple rapid effective once treatment for cutaneous leishmaniasis. It can be as alternative to antimonial therapy but it is not alone curative for mucosal leishmaniasis due to L. braziliensis, which needs systemic treatment and cryosurgery is suggested to be used as an adjunctive or palliative measure (2). This is because there is usually early systemic spread of the parasite to the mucosa although the mucosal lesions may not appear until much later. (16).

References

1. Abdel Aal, H., Hegazy, A., Sharara, L.H., Abdel Aal, N.H. and Bassiouny, N. (1988): Evaluation of ketoconazole in the treatment of cutaneous Leishmaniasis. African J. Dermatol. 1,1, 51.

2. Bassiouny, A. (1983): Cryosurgery in cutaneous leishmaniasis, correspondence. Brit. J. Dermatol. 109, 5, 617.

3. Berman, J.D. and Lee, L.S. (1983): Activity of oral drugs against L. tropica in human macrophage in vitro. American J. of Tropical Medicine and Hygiene 32, 947.

4. Bruceson, A.D.M. (1969): Diffuse cutaneous leishmaniasis in Ethiopia, the clinical and histological features of the disease. Transaction of the Royal Society of Tropical Medicine and Hygiene 63, 708.

5. Bruceson, A.D.M. (1976): Tropical dermatology, cutaneous leishmaniasis. Brit. J. Dermatol. 94, 223.

6. Bulter, P. (1982): Levamisole and immune response phenomena in cutaneous leishmaniasis. J. Am. Acad. Dermatology. 6, 1070.

7. Chulay, J.D., Anzeze, E.M., Koech, D.K. and Bruceson, A.D.M. (1983): High dose sodium stibobluconate treatment of cutaneous leishmaniasis in Kenya. Transaction of the Royal society of Tropical Medicine and Hygiene 77 (5), 717.

8. Cohen, H. and Wahaba, A. (1979): Treatment of leishmaniasis recidivans with intralesional injections of emetine Hel, a case report. Acta Dermat. and Venereol. 59, 549.

9. Coombs, G. and Baxter J. (1984): Inhibition of leishmania amastigote growth by antipain and leupeptin. Am. J. of Tropical Medicine and parasitology. 78, 21.

10. Currie, M.A. (1983): Treatment of cutaneous leishmaniasis by curettage. Brit. Med. J. 287, 1105.

11. Guerra, M., Marsden, P. and Cuba (1981): Further trials of nifurtimox in mucocutaneous leishmaniasis. Transaction of the Royal society of tropical Medicine and Hygiene 75, 335.

12. Gutteridge, W. and Coombs, G. (1977): Biochemistry of parasitic protoza, MacMillan, London.

13. Iskander, I. (1978): Rifampicin in cutaneous leishmaniasis. J. of Internal Medicine 6, 280.

14. Henriksen, T. and Lenden, S. (1983): Treatment of diffuse cutaneous leishmaniasis with cholpromazine ointment. Lancet 1, 126.

15. Heugchong, B.A. (1986): Review, Oriental sore, A look at trends in and approaches to treatment of leishmaniasis. Int. J. Dermatol. 25, 10, 615.

16. Jallife, D.S. and Bruceson, A.D.M. (1983): Cryosurgery in cutaneous leishmaniasis. Correspondence Brit. J. Dermatol. 109, 489.

17. Kager, P., Rees, P., Wellde, E. et al (1981): Allopurinol in the treatment of visceral leishmaniasis. Transactions of the Royal society of tropical Medicine and Hygiene 75, 556.

18. Kandil, E. (1973): Treatment of cutaneous leishmaniasis with trimethroprim sulfamethoxazole. Dermatology 146, 303.

19. Kimmamonk, K., Steck, E., Loiseaux, . et al (1979): Antileishmanial action of lepidines. Am. J. of Tropical Medicine and Hygiene, 27, 751.

20. Marinkelle, C.J. (1980): The control of leishmaniasis. Bulletin of the world Health organization 58, 6, 807.

21. Marsden, P.D., Cuba, C.C. and Barretto, A.A. (1979): Nifurtimox in the treatment of south American leishmaniasis. Transactions of the Royal society of Tropical Medicine and hygiene 73, 335.

22. McCann P., Bacchi, C. and Clarkson, A. (1981): Further on diffuoromethylornothine in African trypanosomiasis. Medical Biology 59, 434.

23. Neva, F.A., Peterson, E.A., Crosey, R., Bogaert, H. and Martinez, D. (1984): Observations on local heat treatment for cutaneous leishmaniasis. Am. J. of Tropical Medicine and Hygiene 33, 5, 800.

24. Pederson, J. and Sawicki, S. (1975): Metronidazone therapy for cutaneous leishmaniasis. Archives of Dermatology. 11, 1343.

25. Peters, W., Laerison, R. and Shaw, J. (1981): Potentiating action of rifamycin and isoniazid against L. mexicana amazonesis. Lancet 1, 1122.

26. Van der Meulen, J., Mock, B. and Fekete, E. (1981): The action of rifampicin/isoniazid against L. aethiopic. Lancet, 2, 197.

27. Weinrauch, L., Livshin, R. and El On, J. (1987): Ketoconazole in cutaneous leishmaniasis. Brit. J. Dermatol. 117, 5, 666.

28. Zilberzetein, D. and Dwyer, D. (1984): Antidepressants cause lethal disruption of membrane function in human protozoan leishmania. Science, 226, 977.

HISTOPATHOLOGICAL AND IMMUNOLOGICAL CHANGES IN EXPERIMENTAL LEISHMANIASIS

by

****Magda Youssef, **Laila Abou Samra and**

***Soheir E Hamam**

****Parasitology and *Pathology Departments**

Faculty of Medicine, Alexandria University, Egypt

Visceral leishmaniasis is a disseminated infection with Leishmania donovani. It has been described in four continents where both endemic zones and isolated cases can occur.(1)

The parasitic strain is important in determining the clinical manifestations of kala-azar in its pattern of transmission. It was found that pathogenicities of L. donovani of various geographic strains appear to differ.(2) Thus in the Near East, the Mediterranean basin and North Chinam Visceral leishmaniasis affects mainly rural children, and dogs are the main reservoir host "Leishmania infantum".(3)

In Egypt, rare cases have been reported since 1904. Some of these were important whereas others were probably authochtonus. Undoubted evidence of transmission in Egypt came from the focus of visceral leishmaniasis discovered in 1982 at El-Agamy, 30 km west of Alexandria, where more than 20 cases were diagnosed and treated. (4, 5, 6, 7)

The human isolates from this locality belong to the L. donovani complex and are more closely related to L. infantum, as evidenced by the isoenzyme pattern of 6-phosphogluconale dehydrogenase.(8, 9)

The aim of this work is to study the histopathological and some immunological changes which may take place in the liver of mice experimentally infected with L. donovani var. infantum (Egyptian Mediterranean strain).

Material and Methods

The Leishmania strain used in this study is Leishmania donovani (Leishmania infantum-Egyptian strain) isolated from an Egyptian child admitted to Shatby Pediatric Hospital. The case was a female 2.5 years old, from El-Agamy district, Alexandria, Egypt.

The complaint was intermittent fever. Physical examination revealed pallor, temperature 38°C, hepatosplenomegaly and enlarged cervical lymph nodes. Blood picture was:

- Hb 4bm/100ml.
- Total leucocytic count 2.500/mm^3.
- Polymorphonuclears 32%
- Eosinophils 0%.
- Basophils 0%.
- Monocytes 6%.
- Lymphocytes 62%.
- Platelets 28.000/mm^3.

The diagnosis was confirmed to be visceral leishmaniasis by bone marrow biopsy and positive serological tests (IHAT and IFAT).

Tanabe's medium (10, 11) was used for initial establishment and development of promastigotes from the amastigotes. It was used also for routine propagation of the strain. Subculture was done every 3 weeks.

Modified El-On's medium (12) was used for mass cultivation of promastigotes required for animal inoculation.

Seventy-five Swiss strain laboratory-bred albino mice were used. They were divided into two main groups:

* Fifty animals all infected with L. donovani promastigotes by intracardiac inoculation under anaesthesia, in a standard dose of 20 x 10^6 promastigotes per mouse. According to the duration of infection animals were subdivided into: group I-a, mice sacrificed one week after infection, groups I-b, I-c, I-d and I-e, sacrificed 2, 4, 8 and 12 weeks after infection respectively.

* Twenty-five animals were used as control, non-infected animals (group II).

After dissection of animals, liver was isolated and divided into two parts. One part was kept at -20°C for indirect fluorescent antibody technique(13), the other was kept in 10% formalin for the histopathological study by H&E and Masson's trichrome stain.(14)

Results

1) Histopathological results:

One week post-infection, liver showed perivascular cellular infiltration with granulomatous formation of lymphocytes, plasma cells and histiocytes (Fig. 15). Liver sinusoids were dilated, Kupffer cells were hyperplastic and prominent. Parasites would be detected inside the hepatocytes and Kupffer cells. No fibrosis was detected. By the end of the second week granulomas were found perivascular and intraparenchymal. Otherwise, no difference from the previous group was noted. After four weeks, granulomas increased in size, they were formed of plasma cells, histiocytes and frequent giant cells. In some animals vascular proliferation and hyalinization of the blood vessels wall was seen.

The parasite was detected in the cytoplasm of both liver and Kupffer cells and even intranuclear parasites could be seen. These nuclei showed early nuclear fragmentation. By the end of the eighth week, granulomas were frequently detected but they were all smaller in size than the early one. By the twelfth week, marked reduction in the size of the granuloma was seen. Hepatocytes were still showing few degenerative changes, but neither necrosis nor fibrosis was observed.

2) Immunofluorescence results:

The liver of normal non-infected animals were absolutely negative in the test.

One week after infection, at a titre of 1/32, fluorescence was observed around the hepatocytes, the dilated vessels and in areas showing granuloma, while at a higher dilution (titre of 1/64) selection of fluorescence occurred and became localized to the zone of granulomas and vessels. At a titre of 1/128, fluorescence appeared as a faint thin peripheral rim around the granulomas. Eight weeks after infection, fluorescence was observed in the same sites at a lower titre (1/4). Twelve weeks after infection the test was negative.

Discussion

In this study, the development of the granuloma was the characteristic histopathological lesion in the liver of all infected animals. Granulomas consisted mainly of lyphocytes, plasma cells, histiocytes and frequent giant cells. L. donovani bodies were seen inside Kupffer cells as well as inside the hepatocytes.

Although it is well known that L. donovani is primarily a parasite of cells of mononuclear phagocytic series, it was also detected in the hepatic parenchymal cells.

A similar finding was previously reported in human Kalaazar and was documented by ultra-structural studies (15, 16, 17). Of utmost importance is the observation of L. donovani anastigotes inside the nucleus of some hepatocytes with early nuclear fragmentation. The reason is not clear and further investigations are recommended.

IFAT showed fluorescing deposits throughout the first four weeks which present the leishmanial antigen either free or in antigen-antibody complex. Eight weeks after infection fluorescence was observed at lower dilutions while it became negative after twelve weeks. These findings coincide with the histopathological findings where granulomas had healed and lesions resolved completely without residual damage.

It was found that during the course of visceral leishmaniasis there is a large amount of immunoglobulins at high titres, which are non specific as well as specific (18, 19). Amastigotes were also shown to liberate antigenic substances (20). Thus, the presence of L. donovani soluble antigen or antigens, corresponding antibodies, and the component of complement leads to the formation of circulating immune complexes (21). It is likely that immune complexes were initially deposited in the hepatic tissue. It was reported by Farsh et al. (22), that infected macrophages have leishmania antigen on their surfaces, and presumably immune complexes can form on them (23). Considering this information, it can be suggested that deposition of immune complexes in the detected sites is likely to be in part due to the circulating antigen-antibody complex, and also to be locally formed complex in situ.

References

1. World Health Organization. The Leishmaniasis Technical report series 701. Geneva 1984; 53.

2. Stauler, L.A. Characterization of strains of Leishmania donovani. Expx parasitol 1966; 18: 1-11.

3. Robbins, S.L., Contran, R.S., Fung, K.V. Protozoal and helminthic diseases and sarcoidosis. In: Pathologic basis of diseases 3rd ed. Philadelphia London Toromo Mexico City. W.B. Saunders Co. 1984; 351-98.

4. World Health Organization EM IPD 120 Report of a symposium on recent developments inland planning for leishmaniasis control. Islamabad 13-22 April 1985; 8.

5. Cahill, K.M., Kordy, M.I., Girgis, N., Atalla, W., Moftyk, A. Leishmaniasis in Egypt Trans R Soc Trop Med Hyg 1966; 60(1): 79-82.

6. Tawfik, S., Kassem, S.A., Aref, M.K., Awadalla, H.N., Abadir, A. A preliminary report on two cases of visceral leishmaniasis in Egypt. Trans R Soc Trop Med Hyg 1983; 77(3): 334-5.

7. Adamson, P.B. Visceral leishmaniasis in Egypt (correspondence). Trans R Soc Trop Med Hyg 1983; 77(6): 879-80.

8. Mansour, N.S., Awadalla, H.N., Youssef, F.G., Tawfik, S. Characterization of Leishmania isolates from children with visceral infections contracted in Alexandria, Egypt (correspondence) Trans R Soc Trop Med Hyg 1984; 78: 704.

9. Awadalla, H.N., Mansour, N.S., Mohareb, E.W. Further characterization of leishmania isolates from children with visceral infection in Alexandria area, Egypt. Trans R Soc Trop Med Hyg 1987; 81: 915-7.

10. Tanabe M on the conditions necessary for the development of Leishmania donovani in vitro. Saikingku Zasshi (J Bact) 1923: 33: 425-6 (Summarized in Japan Med World 1942; 4: 46).

11. Lightner, L.K., Chulay, J.D., Bryceson, A.D.M. Comparison of microscopy and culture in the detection of Leishmania donovani from splenic aspirates. Am H Trop Med Hyg 1983; 32(2): 296-9.

12. Schnur, L.F., Zukermen, Aviveh. Leishmanial excreted factor (EF) Serotypes in Sudan, Kenya and Ethiopia. Ann Trop Med parasitol 1977; 71(3): 273-94.

13. Wilson, M., Sulzer, A.J., Walls, K.W. Modified antigens in the indirect immunofluorescence test for Schistosomiasis. Am J Trop Med Hyg 1974; 23(6): 1072-6.

14. Drury, R.A.B., Wallington, E.A. Carleton histological technique Sthed Oxford New York Toronto. Oxford Unipress 1980.

15. Bradley, D.J., Poole, J.C.F., Lamb, R.M. Some observation on chronic visceral leishmaniasis of the mouse. Trans R Soc Trop Med Hyg 1973; 67: 21-2.

16. Daneshbod, K. Visceral leishmaniasis (Kala-azar) in Iron: A pathologic and electron microscopic study. Am J Clin Pathol 1972; 57(2): 156-66.

17. Pampiglione, S., Manson-Bahr, P.E.C., Guingi, F., Guingi, G., Parenti, A., Trotti, G.C. Studies on Mediterranean Leishmaniasis. 2. Asymptomatic cases of visceral leishmaniasis. Trans R Soc Trop Med Hyg 1974; 68(6): 447-53.

18. Manson-Bahr, R.E.C., Wilson, V.L.C. Hepatic granulomas in monkeys infected with Leishmania donovani. Trans R Soc Trop Med Hyg 1976; 70:20.

19. Bray, R.S. Immunodiagnosis of leishmaniasis. In: Cohen, S., Sadun, E. Immunology of parasitic infections. London Black Well Scientific Publications 1976; 66.

20. Nattan-Larrier, P.L., Gtimard-Richard, L. Une méthode de diagnostic de la leishmaniose visceral. Compt Rend Soc Biol 1933; 113: 1489-02.

21. Kohanteb, J., Ardehali, S.M., Rezai, H.R. Detection of Leishmania donovani soluble antigen and antibody in the urine of visceral leishmaniasis patients. Trans R Soc Trop Med Hyg 1987; 81: 578-80.

22. Faroh, F.S., Samara, S.A., Nuwayri-Salti, N. The role of the macrophage in cutaneous leishmaniasis. Immunology 1975; 29: 755-64.

23. Ridley, D.S., Ridley, M.J. The evolution of the lesion in cutaneous leishmaniasis. J. Pathol 1983; 141: 83-96.

HYDATIDOSIS IN JORDAN: A REVIEW

Elias K. Saliba

This presentation is primarily based on a review published in collaboration with two colleagues from Yarmouk University, Dr. Fadwa Al-Yaman and Professor Sami Abdel-Hafez.[1]

As is known, hydatidosis is caused by the larval stage of Echinococcus. The life cycle of the parasite involves a canine as eh definitive host and a herbivore as the intermediate host where the hydatid cyst is found. Man acquires hydatidosis if he ingests the eggs of the parasite as do herbivores.

In Jordan, only one study involving the prevalence of Echinococcus in the definitive host was published. In their paper, Ajlouni *et al.* (1984)[2] reported that the prevalence of the adult worm in the small intestine of stray dogs collected from different areas of Jordan varied from one governorate to another. It ranged from a maximum of 20% in dogs collected from Irbid governorate to zero in dogs collected from the latter governorate was, however, small (15 dogs) and that might have been one reason for the absence of infection in dogs there. The overall prevalence rate in the country was 15% and the number of worms per dog ranged from 5-400.

On the other hand, the incidence of the larval stage (metacestode) in herbivores received more attention and was studied by several investigators. In Amman area, Dajani (1978)[3] found the incidence in sheep to range from 1.3 to 4.5 while Dajani and Khalaf (1981)[4] reported that the incidence in cattle, goats and camels ranged from 5.2 to 5.3, 0.5-2.3 and 26.7, respectively. Work in the northern areas of Jordan was more extensive. Al-Yaman *et al.* (1986)[5] reported that the infection rates within hydatidosis in sheep, goats, cattle and camels were 4.0, 3.6, 11.4 and 8.8, respectively. Of the infected animals, camels had the highest percentage of fertile cysts (66.7%). The lung was the predominant infected site in camels, cattle and goats while in sheep the liver was the main organ affected.

A subsequent study on animals carried out by Abdel-Hafez *et al.* (1986)[6] during a period of a drought which led to the slaughtering of older animals, mostly females, revealed a higher infection rate than was reported by Al-Yaman *et al.* (1986). Although the overall incidence was 27.8%, ewes 4 years of age and older had a rate of 63.7%. Abo Shehada (1988)[7] studied the prevalence of hydatidosis in donkeys and found that 17.2% of the examined animals had cysts.

The actual incidence of hydatidosis in humans in Jordan is not known and very often confirmed cases are not reported to health authorities. Sliman (1976)[8] reported on 12 cases of pulmonary hydatidosis seen at a military hospital during a three-year period (1967-1969). Dajani and Shehabi (1979)[9] reported an infection rate of 2.4 per 1000 admissions at the Jordan University Hospital. El-Muhataseb (1984)[10] reviewed 75 cases of liver hydatidosis operated upon during a nine-year period at the same hospital. Emphasizing the importance of the disease in humans, Shennak _et al._ (1984)[11] reported that 63 of 800 patients admitted to Al-Bashir Hospital in Amman with hepatomegaly had hydatidosis.

The parasite so far reported from Jordan is _Echinococcus granulosus_. Strain characterization of the parasite received considerable interest recently since it is of epidemiological significance. The experimental studies, whether morphological, immunilogical or biochemical, that were carried out by the Yarmouk University group (Hamarsheh, 1986[12]; Said 1987[13]; Said _et al._ 1988[14]; Al-Yaman _et al._, 1988[15]; Hijjawi, 1989[16]) indicate that three strains of _E. granulosus_ probably occur in Jordan. The first affects sheep, goats and cattle; the second camels and possibly humans; and the third, donkeys. Further work on the characterization of the parasite stains is needed to unveil the overall picture of the epidemiology of hydatidosis in Jordan and to help in formulating an effective control program.

References

1. Al-Yaman, F.M., Abdel Hafez, S.K. and Saliba, E.K. 1988. Jordan Med. J. 22:7.

2. Ajlouni, A.Q., Saliba, E.K. and Disi, A.M. 1984. Z. Parasitenkd, 70: 203.

3. Dajani, Y.F. 1978. Trans. Roy. Soc. Trop. Med. 72: 320.

4. Dajani, Y.F. and Khalaf, P.H. 1981. Ann. Trop. Med. Parasitol. 75: 175.

5. Al-Yaman, F.M., Assaf, L., Hailat, N. and Abdel-Hafex, S.K. 1986. Ann. Trop. Med. Parasitol. 79:89.

6. Abdel-Hafez, S.K., Al-Yaman, F.M. and Said, I.M. 1986. Z. Parasitenkd. 72:89.

7. Abo-Shedada, M.N. 1988. Vet. Parasitol. 30: 125.

8. Sliman, N.A. 1976. Jordan Med. J. 11: 33.

9. Dajani, Y.F. and Shihabi, K.N. 1979. Dirasat VIII: 17.

10. El-Muhtaseb, H.H. 1984. Jordan Med. J. 18: 35.

11. Shennak, M., Tarawneh, M.S., Amr, S.S., Al-Sheikh, T.M., Abu-Rajab, M.T. and Grec, S.S. 1985. Ann. Trop. Med. Parasitol. 79: 443.

12. Hamarsheh, N.M. 1986. M.Sc. Thesis. Yarmouk University.

13. Said, I.M. 1987. M.Sc. Thesis. Yarmouk University.

14. Said, I.M., Abdel-Hafez, S.K. and Al-Yaman, F.M. 1988. Int. J. Parasitol. 18: 1111.

15. Al-Yaman, F.M., Abdel-Hafez, F.M., Assaf, L.M. and Malkawi, E.K. 1988. Jap. J. Parasitol. 37: 133.

16. Hijjawi, M.S. 1989. M.Sc. Thesis, Yarmouk University.

HYDATID DISEASE: A COMPARATIVE STUDY IN THE MEDICAL CITY TEACHING HOSPITAL AFTER 10 YEARS

A.H. Khalili, T.I. Aljeboori*, Remm Munir & M. AlSammak**

***College of Medicine, Baghdad**

****Ministry of Health, Baghdad**

Abstract

In a study based on patients admitted to the MCTH Baghdad during three years period (1971-1973 Vs. 1980-1982), hydatid disease was found to be still a public health problem. In this tudy, the patients were admitted from all parts of Iraq; about 50% of the cases were referred from provinces other than Baghdad. The total number surgically proved hydatic disease 392, with an average of 131 per year. More females (57.2%) than males (42.8%) were infected, the females being mostly housewives. The disease was found in all age groups but the majority were between the age of 20-30 years. About 75.2% of the cases were infected with single cyst, nd 24.8% with multiple ones. The highest percentage of infection was found in liver, the lungs being the next. About thirty one percent of the cases were recurred. These results compared with a similar study done in the same center 10 years ago.

Introduction

Hydatid disease is one of the important parasitic zonotic diseases, and in general the disease has a cosmopolitan distribution. It is caused by the larval stage, hydatid, which belongs to the genus Echinococcus. In Iraq, the only species recorded is E. granulosus which cause the vesicular or unilocular echinococcosis (5, 6). This species is the most common one in its geographical distribution among all other species of the same genus.

Hydatid disease is one of the serious public health problem in many countries. The Middle East has been cited as among those areas of the World in which hydatid disease is most prevalent. In this country the disease is considered as one of the most serious helminthic disease. In recent years more information and studies has been done by many workers on its geographical and prevalence rate both in man and animals, to name but a few (4, 7, 10, 13, 15, 19).

A decade ago, an internationally approved recording system was introduced into the Medical City Teaching Hospital (MCTH). Using this system, a study was done on the prevalence of the disease in man for three years period 1971-1973 (2).

The overall incidence with hydatid was 0.8% or 8 per 1000 patients admitted for all reasons. Important gaps in our knowledge of this disease still exist, preventing efforts directed at its proper diagnosis, treatment, prevention, control and finally eradication of the disease in this country, an objective which has been accomplished by several countries. Due to the fact that, in Irq, the medical services has been improved for the last decade, where new and well equipped hospitals were built with different specialties, and the surgery was one of these. The objective of this study, therefore, was to assess the seriousness of this disease in comparison with the study which was done 10 years ago in the same center, by examining the records of surgically proved cases with hydatid disease for three years, during the period 1980-1982 inclusive.

Patients and Methods

The MCTH was chosen for this study. It is the largest hospital in Iraq with a capacity of about 1400 beds (children hospital is included). The records of patients of the MCTH with surgically proven hydatad disease for the period 1980-1982 were studied. From each case record, the following information were obtained: site or location of the cyst in the body (single or multiple), age, sex, occupation of the patient, as well as his place of residence. The recurrent of hydatids also were recorded.

Results

Prevalance: This study revealed a total of 392 patients operated on and proved to be positive hydatid cyst in this hospital during the three years period. This gives an annual surgical case rate of about 131 per year. The average total number of patients admitted for all reasons to the MCTH was 319.68. Thus, the overall incidence of the disease among all patients admitted to this hospital was 0.4% or 4/1000 (Table 1) Vs. 8/1000 in the previous study.

Age and Sex: The prevalence was highest among the age group 20-30 years (Figure 1). The youngest surgically proved case was less than four years old and the oldest between 80-90 years of age. Females were more frequently infected than males (57.2F vs 42.8M) Fig. 2.

Table 1. The incidence of hydagid cysts in patients admitted to the MCTH in Bagdad during 1980-1982

Year	Total No. admitted	No. (+) for H.C.	No. with H.C./1000
1980	32027	131	4.0
1981	32140	130	4.0
1982	32737	133	4.0
Average	31968	131	4.0

The fractions are omitted in this table.

Sites and type of Infection in 236 cases (55.2%) there were cysts in the liver which was the highest, 117 cases (27.3%) were in the lungs, 18 (4.2%) involved the intra-Peritoneal, and 14 (3.2%) in the kidneys. The other rare sites, 43 (10%) and 0.4% were unspecified (Table 2). In the females, the liver was more frequently infected than the males, which was not the case with the lungs where both males and females were equally infected.

Out of the 392 surgically proved hydatid, 295 (75.2%) were solidary and 97 (24.8%) were with multiple cysts, and both types of cysts, the solidatry and the multiple were more in the females than in the males (Table 3).

Geographical Distribution: Almost half the number of the cases were from the City of Baghdad, and the other half (50.5%) referred to the MCTH from other governorates. The highest number, 35 (8.9%) referred from Al-Anbar Governorate (Table 4).

Occupation: was recorded for all cases with the exception of one unspecified patient (0.25%) in comparison with the previous study (Table 5). One hundred eighty two (46.9%) were identified as housewives and 53 (13.5%) of the patients as students. The rest 45 (11.4%) were staff employee, 37 (9.4%) workers, 16 (4%) free occupation, 15 educational, 14 farmers, 9 children, 7 disabled, 6 retired, 4 engineers, 2 medical occupation, and one para-medical.

Recurrent Hydatid Cyst Cases: out of 392 recorded cases, 120 (30.6%) were recurrent. More females were recurrent than males, (67.5F% Vs. 32.5M%). The majority involved the liver 72 (60%) and the lungs, 38 (25.8%) and 66 (55%) of these cases were housewives.

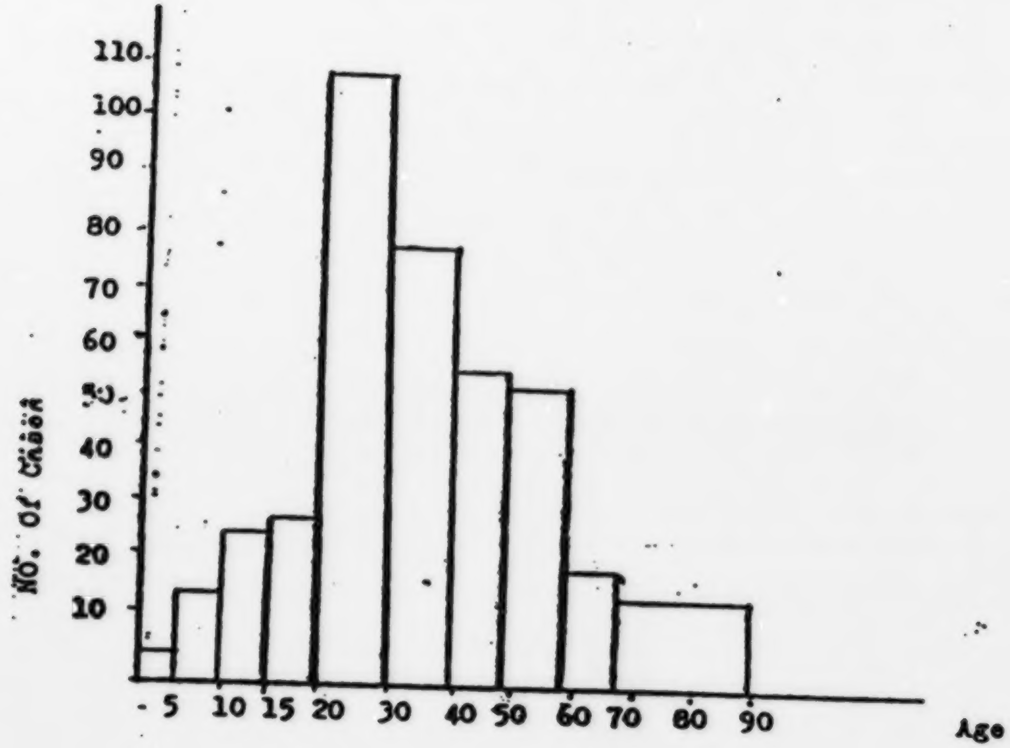


Figure 1. Age distribution of 392 patients with hydatid cyst admitted to the MCTH In Baghdad during 1980-1982.

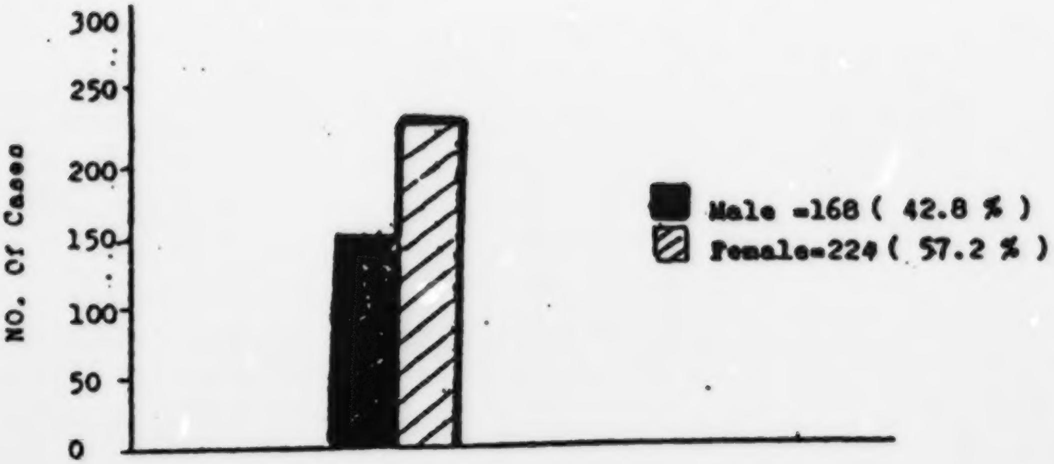


Figure 2. Sex distribution of 392 patients with hydatid cyst admitted to the MCTH in Baghdad during 1980-1982.

Table 2. Organ distribution of hydatic cyst of 392 patients admitted to the MCTH in Baghdad during 1980-1982

Organ	Number of Infected	Percent (+)
Liver	236	55.2
Lung	117	27.3
Intraperitoneal	18	4.2
Kidney	14	3.3
Other sites	43	10.0
Total	428	100.0

This difference of 36 cases from the original No. 392 is due to the fact that some patients had multiple sites of hydatid cyst.

Table 3. Types of hydatid cysts with relation to sex of 392 patients admitted to the MCTH in Baghdad during 1980 - 1982

Types of FS	Number	Sex				Total
		M	S	P	S	
Solitary	235	121	43.05	168	59.9	75
Multiple	97	41	42.2	56	57.7	24

Table 4. Geographical distribution of 392 patients with hydatid cyst admitted to the MCTH during 1980 - 1982

Province	No. of cases	Percent (%)
Baghdad	194	49.4
Al-Anbar	35	8.9
Babil	23	5.9
Diela	21	5.4
Wagit	20	5.1
Salh-Eldin	20	5.1
Dhiqar	14	3.6
Al-Tasmeem	12	3.1
Others	53	13.5
Total	392	100.0

Table 5. Comparisons between the distribution of hydatid cyst among patients of different occupations admitted to the MCTH in Baghdad during 1980 - 1982 with the study of 1971 - 1973

Occupation	Study of 1980-1982	Percent +	Study of 1971-1973	Percent +
Housewives	182	46.42	382	48.27
Students	53	13.52	37	9.81
Staff employee	45	11.47	/	/
Workers	37	9.43	55	14.58
Free occupation	16	4.08	24	6.36
Educational	15	3.82	8	2.12
Farmers	14	3.57	24	6.36
Children	9	2.28	26	6.89
Disabled	7	1.78	/	/
Retired	6	1.53	17	4.50
Engineers	4	1.02	/	/
Medical occupation	2	0.51	/	/
Paramedical	1	0.25	/	/
Unspecified	1	0.25	/	/
Soldiers	/	/	2	0.53
Total	392	100	377*	100

* The rest of the original No. (642) their occupations were not recorded.

Discussion

In order to have effective control programme and ultimately cradication of the disease, a nation wide study to determine the incidence and prevalence of the disease in human, as well as in animals is essential. If, and when undertaken, must be based on reasonable and reliable estimate of the prevalence of the disease. this will give us a good idea about its gravity and impact on health.

One of the most reliable indices for the disease is studying the hospital records. Although several studies have been done on human hydatid disease (3, 7, 10, 11), but still the hospital records are considered to be the only and most reliable source of data on the disease in human, since incorrect diagnosis in surgical cases of hydatid disease is rare. Errors are undoubtedly present in data concerned with residence of patients, however. Because hydatid disease is not a reportable disease and in order to study the disease in human, the records of the MCTH were chosen for two reasons, one that this hospital adopt the WHO system of recording which is accurate and reliable, and second to compare this study with the previous one done in the same hospital, 10 years ago and also for three years period (2).

The rate of prevalence found in this study, was 0.4% or 4 per 1000 patients admitted to the MCTH for whatever reason. This is very much less than the previous estimate (0.8% or 8 per 1000)(2), in spite of the fact the average number of cases admitted for three years was 31968, which is more than the one in early 1970 (26936). This increase in the number admitted to the MCTH in Baghdad, probably due to the increase in the number of beds from 1100 to 1400. But this rate is indeed higher than many countries (8, 16, 17) and indicate the serious spread of the disease in Baghdad, as well as in other districts of Iraq.

Furthermore, this figure must be taken with some caution, because the MCTH is a referral hospital and 50.5% of the cases were referred from districts other than Engined ____________, thus, the practice of referring patients from the provinces to Baghdad (MCTH) still exists in spite of the fact that many new and well equipped hospitals were built with several specialities. Therefore, one could speculate, that the decrease in the prevalence rate, 4/1000 patient, is possibly due to general improvement in the standard of hygiene and sanitation both on the personal and community levels.

As for the age distribution with hydatid disease, it was found that there was no change in the pattern from that reported 10 years ago (2). The highest prevalence was between the age of 20-30 years. The same finding was reported by many workers (1, 11, 15, 16, 17). On the other hand some (3) found the majority between the age of 20-40. Age resistance in man to hydatid disease is still a matter of speculation with little evidence to support it. Most of information on this subject was obtained from the surgically proved cases with the disease by studying the hospital records. On experimental basis, it was found that younger albino mice were more susceptible to infection with E. grannelosus scolices given intraperitoneally than the older ones (8).

The sex distribution (Fig. 2) show more females (57.2%) than males (42.8%) were infected with hydatid disease. This also has been reported by many workers in Iraq and other countries (3, 11, 17). However, this result does not agree with the studies of other workers, where they found more males were infected than females (3, 9, 14). Furthermore, still some studies showed no difference in the frequency of infection with hydatid disease between males and females (1, 16, 18). Experimentally, it was found that male mice were more susceptible to infection with the disease than females, and they suggested the testosterone seems to increase the susceptibility of animals to infection (8). From these results, it seems that different authors have reported different results concerning the sex. Therefore, these differences may be due to some epidemiological factors such as occupational risk, as the majority of cases were among the housewives, or it may be due to the fact, that more females were admitted to the hospital than the males, which is the case in our study (16,91F Vs 15,049M). But one must keep in mind that about 100 beds of the total number of the MCTH beds belongs to the Department of Gynaecology and Obstetrics.

One of the interesting observations noticed in this survey study was the fact that the highest percentage of infection was in the liver (55.1%) and the lungs being the next (27.3%). This finding does agree with the majority of the investigators, but does not agree with the previous study (2), done 10 years ago and in the same hospital, where the majority of hydatid cysts were in organs other than the liver, especially the lungs. This probably could be explained by the fact that, in the early 1970, the MCTH was considered a major referral hospital for chest surgery, hence more cases were reported in the lungs than in the liver. But, nowadays and, after the awareness of the importance of the chest diseases, more sections of chest surgery with chest specialists has been established in different parts of Iraq since 1970. Therefore, the number of referred cases for chest surgery to the MCTH is less than before, which may explain less number of cases with lung hydatid.

The number of recurrent cases of hydatid either in the same organ or other organs or sites was very high, 120 (30.6%) out of 392 recorded cases. This high recurrent number may be due to one of the three following possibilities: improper surgery; or at the time of investigating the primary cyst, very small cysts were imbedded in tissues and organs, and which were overlooked macroscopically as well as by the different methods of diagnosis, and which were developed later; a third possibility is that, the same individual might be reinfected again.

From these data, one can conclude that in spite of the fact the number of recorded cases with hydatid is decreased to the half the number reported in 1976, but the disease hydatid is still a major public health problem in Iraq. Furthermore, one must keep in mind that these data may not represent the true picture of the disease in Iraq, but they should provide some base line for future estimates. Therefore, and in order to have a long term plan for effective control, prevention and finally eradication of the disease, a nation wide study to find the incidence and prevalence of the disease in human, as well as in animals is advisable using all methods of disease detection.

When this will be accomplished, we will be in a good position to assess the disease on a nation wide. Furthermore, the data which will be obtained could be used for comparison with other countries based on percent in relation to population.

References

1. Abou-Daoud, K.T. and Schwabe, C.W. Epidemiology of echinococcosis in the Middle East, III. A study of Hydatid disease in patients from the city of Beirut, Amer . J. Trop. Med. Hyg., 13: 681-685, 1964.

2. Aljeboori, T.I. Hydatid disease: a study of the records of the Medical City Hospital, J. Fac. Med. Baghdad, 18, 65-75, 1976.

3. Al-Najar, S. Evaluation and purification of hydatid fluid antigen in the serodiagnosis of hydatidosis with special reference to Casoni skin test, M. Sc. Thesis, College of Medicine, Baghdad University, 1981.

4. Al-Saqur, A.K. and Al-Jorani, A.M. The larval stage of cestodes in the internal organs of sheep, J. Biology Sc. Res. 18(3): 33-41-, 1987.

5. Babero, B.B. and Al-Dahagh, M.A. The zoonosis of animal parasite in Iraq. IV. An experimental infection of a dog with Echinococcus of human origin. J. Fac. Med., Baghdad, 5, 79-84, 1963.

6. Babero, B.B., Al-Dahagh, M.A., Al-Saffar, A.S. and Frozan, M.A. The zoonosis of animal parasites in Iraq. VIII. Hydatid disease, Ann. Trop. Med. parasitol, 57, 499-510, 1963.

7. Elhassani, N.B. Pulmonary hydatid disease in children, J. Roy. Coll. Surg. Edinb, 28 (2): 460-467, 1983.

8. Frayah, G.T. and Dajani, R.M. E. granulosus in Albino Mice-Effect of host sex and hormones on the growth of hydatid cysts, Exp. parasitol., 29, 252-262, 1971.

9. Imari, A.T. Pulmonary hydatid disease in Iraq, Amer. J. Trop. Med. Hyg., 11: 481-486, 1962.

10. Khairy, F. and Mukhlis, G. Brain hydatid disease, Clinical and epidemiological study of fifty patients, J. F. Med. Baghdad, 29-(4): 417-427, 1987.

11. Mahmood, S.S. Studies on hydatid disease in Mosul. M. Sc. Thesis. University of Mosul, 1980.

12. Nasrir, J.K. Immunological and serological studies in patients with hydatidosis, M. Sc. Thesis, College of Medicine, Baghdad University, 1979.

13. Niazi, A.D. Hydatidosis in Iraq, Bull Endem. Dis., 15, 37 1974.

14. Oytun, H.S. Hydatidose in der Turkei, Trop. Med. parasit., 8: 196-199, 1958.

15. Sarsam, A. Surgery of pulmonary hydatid cysts, J. Thoracis Cardiovas Surg. 62: 663-68, 1971.

16. Schwabe, C.W. and Abou-Daoud, K.F. Epidemiology of echinococcosis in the Middle East. I: Human infection Lebanon 1949-1959, Amer. J. Trop. Med. Hyg., 10, 374-481, 1961.

17. Schwaket, T.N. and Al-Waidh, M. Hydatid cysts of the kidney simulating similar to kidney lesion, Brit. J. Urology. 46: 371, 1974.

18. Suic, M. L-echinococcose in Yugoslavia, W.H.O. Bull., 17: 492-495, 1957.

19. Talib, H. Some surgical aspects of hydatid disease in Iraq, Brit. J. Surg., 55: 576-586, 1968.

BRUCELLOSIS IN ANIMALS:

CONTROL AND PREVENTATIVE MEASURES IN JORDAN

Abdul Aziz, N.*, Schenkel, F.*

Introduction

Synonyms:

When occurring in humans:
Undulant fever, Malta fever, Mediterranean fever.

When occurring in animals:
Contagious abortion, abortus fever, infectious abortion, epizootic abortion (2).

Etiology:

The genus Brucella has six known species:
B. melitensis, B. abortus, B. suis, B. neotomae, B. ovis and B. canis (2).

The first three are subdivided into biotypes, distinguishable by different biochemical characteristics, and by reactions to the monospecific A (Abortus) and M (Melitensis) sera. B. melentensis is subdivided into 3 biotypes, B. abortus into 8, and b. suis into 4.

At present Brucellosis is perhaps the most widespread and economically devasting of the zoonotic diseases (7). It occurs in all of man's domesticated and semi-domesticated animals as well as in the wild.

Adding to the problem of disease occurrence in man is the fact that the primary resource reservoirs are such common domestic animals as cattle, sheep, goats, and swine. As long as susceptible animals are present, there are no limits to the distribution of this organism in nature, and Brucellosis can be found in moderate climates, in the tropics, the deserts, and the arctic areas.

---

* Epidemiology and Production Monitoring Section, Animal Production and Health Department, Ministry of Agriculture, Amman, Jordan

The classical species of brucella bacteria are *B. abortus*, *B. melitensis*, and *B. suis*. Several biotypes are identified but these are limited to specific host ranges. Brucella is characteristically localized in the reproductive tract of male and female hosts, but because of abortion, females are the main source of environmental contamination. Abortion leads to a massive exodus of the organism from its host. Subsequently infection occurs under conditions that do not necessitate host to host contact. Females that have aborted carry the organism in their lymph nodes, primarily those of the supra mammary region. This leads to a shedding of the organism, probably for the rest of their lives, via the mammary glands. This type of exodus leads to transfer under circumstances where there is close host to host contact, as during lactation of the young. In addition, brucellosis can be sexually transferred. This mode of transmission may be common among dogs and swine, and to a lesser extent among sheep and goats. Sexual transfer appears to be almost inexistent as a mode of infection in cattle (7).

Brucella has a multitude of entrances to the body. It can penetrate through the mucus membranes, the eye, the mouth and the stomach, as well as through unbroken skin, and of course through skin lesions. Infection can be dust borne, droplet borne or can be by inhalation.

Viability of Brucella Bacteria

Brucella organisms have excellent survival mechanisms under a variety of environmental conditions. Upon excretion from infected animals they are able to survive in faeces, urine, soil, water, bedding and food for long periods of time.

For example, *B. melitensis* survived in:

urine	49 days,
contaminated water	38 days,
potable water	72 days,
urine dried onto a textile sack	80 days,
dried organic material such as faeces	± 9 months.

It can live almost indefinitely in damp soils, and freezing is the best method to preserve viability (7). At low pH (pH4) survival rates decline to about 1 week to 10 days. Brucella is very susceptible to heat. Temperatures of 100°C are immediately lethal, 90°C lethal after 1 minute, 62°C after 10. Disinfectants are efficient as well: Lysol (1%) or Formalin (2%) destroy the bacteria after 15 minutes, and sunlight after a few hours. More details and findings from different sources are listed in Tables IV and V.

The Disease Transmitted to Humans

Human brucellosis exists only as a function of brucellosis in animals. In Jordan 43 isolates of B. melitensis from humans were documented (5) and pointed to small ruminants as the source of infection, confirming earlier results (3). Humans become infected by contact with infected animals (Graph II) by consuming food of animal origin, such a soft cheese or non-pasteurized/non-boiled milk, or crops contaminated with infected animal wastes. Meat from infected animals contains only small numbers of brucellae, and the meat must be eaten raw to result in infection. Cases of brucellosis from meat ingestion are rare (1). The most pathogenic species are B. melitensis, B. abortus, B. suis and B. canis. The incubation period is from 1 to 3 weeks, but sometimes can be as long as several months. Since sick persons are considered as non-productive members of the community, the disease is termed a socio-economic illness. The disease may be debilitating if not correctly cared for in the early stages.

The Disease in Animals

The incubation period is from 1 to 36 weeks. The predominant symptoms in pregnant females are abortion and either premature or full term birth of dead or weakened animals. All species may cause abortion in their natural hosts.

Generally abortion occurs during the second half of pregnancy, often with retention of the placenta and metritis. Other serious diseases from Brucella infection are mastitis, arthritis and orchitis.

Control of Brucellosis in Sheep and Goats

In any country the prerequisite of efficient brucellosis control is a knowledge of the extent of the problem. Two avenues are available.

1. Eradication by Test-and-Slaughter

   On a national scale, eradication has so far been achieved only by identifying infected herds and slaughtering all the animals of the herd.

2. Control of Immunization

   Where B. melitensis infection is endemic and widespread in a population of small ruminants, control by immunization is recommended, in most situations, at least as a preliminary step (6, 11).

Immunizing agents prevent abortion because there is an almost tissue specific immunity in the reproductive tract. However, immunization does not prevent infection.

Even under the most favourable circumstances, and with choice vaccines, immunization is at best 80% effective. However, it increases the level of herd immunity, and this is important in both control and eradication programs. Since immunization prevents abortion, it eliminates the main avenue the organism has to contaminate the environment through a mass exit from the host. Infection of new animals through environmental contact is substantially lowered.

When used alone immunization is a control measure, but cannot eradicate the disease. Immunization pushes the Brucellosis incidence to a level that leads both to reduced infection in man, and increased numbers of offspring in animals.

Since this disease affects adult animals, the normal course of events is to vaccinate the young before they reach good. For sheep and goats aged less than 6 months, the live ("Rev1") agent should be used. The live agent will be completely eliminated upon sexual maturity.

Alternatively all animals can be vaccinated using the regular dose in young animals and a reduced dose in adult animals. The vaccination of adult animals produces a titer.

It is not possible to differentiate between a vaccination titer and an infection titer, because the antibodies are similar.

For sheep and goats the vaccine in use is "Rev1". It is a live vaccine with reduced virulence. It is pathogenic to man, as is the "S19" vaccine used to immunize cattle. Accidental inoculation or spraying on the face can lead to the disease in man.

Flock Disease Survey in Jordan, Emphasizing Brucellosis

Currently the main livestock populations are as follows: sheep 1 million; goats, 500,000; cattle, 30,000; camels, 10,000; horses, 3,000; poultry, 1 million parent stock, and 3 million layers.

In 1971-72 a limited investigation was done using tube agglutination and CFT. All sheep and cattle showed negative results in serological tests, except for two flocks of imported "Shami" goats (315 animals). Seven per cent of the animals examined in these two flocks had a positive titer. They were condemned (1).

In 1977-78, 6,000 sheep and goats from 211 randomly selected flocks were screened using "Brucellin" (9). Thirteen goats tested positive for brucellosis, most of them belonging to the "Shami" breed. These were slaughtered. Sheep did not show positive results. Within this investigation, 1,000 cattle were also examined. One animal had a positive titer for brucellosis and was condemned. Since 1983 considerably higher rates of brucellosis occurrence have been documented in sheep and goats, as well as in humans. Increased occurrences mostly in the northern governorates, may very likely be the result of animal trade with neighbouring countries that passed on the disease.

Brucellosis and Other Important Sheep and Goat Diseases

Besides Brucellosis, Q. Fever, Chlamydiosis, Leptospirosis, Blue tongue and Toxoplasmosis are diseases that affect the production and maintenance of livestock. Most of them are of special concern to public health. In 1987, therefore, a survey to detect their occurrence was implemented through a German technical cooperation project.

In each governorate flocks were selected at random. They were visited by a team of department staff, consisting usually of one veterinarian, one livestock production specialist, and one stock assistant. For each flock a questionnaire was completed. It was intended to record information about general farm aspects and practices, health of the small ruminant flocks, and flock structure and dynamics.

A limited number of animals, usually about 20 per flock, was selected and specific health-related observations were made. From these animals, blood samples were taken and were submitted for laboratory examination.

During 1987/88 serum samples from 471 randomly selected flocks were analyzed (Table II and III). Forty-four per cent of the non-vaccinated flocks tested positive. The highest percentage of positive flocks was in Mafraq, with 65%; the lowest in Ma'an with 23%. This reveals the fact that Brucellosis is widespread (Graph I).

Furthermore, results from serum samples collected in 1989 show that there is an increase in Brucellosis prevalence in sheep and goats. Out of 800 samples tested (Jan. - Aug.) for Brucellosis, 12% were positive, against 9% from 4,669 samples in 1987, and 7% from 2,711 samples in 1988.

Brucellosis in Cattle

In testing 3,815 cattle for Brucellosis, a prevalence of 1.8% was found in the 1988 survey using CFT and RBT. Positives were slaughtered, with farmers compensated for the loss.

Table II illustrates Brucella prevalence by governorate in 1987/1988, and Table III shows the prevalence of Brucellosis as well as of other infections during this time.

Control Program

Because of the seriousness of Brucellosis, its control is of national concern, and calls for the cooperation in Jordan of the Department of Public Health, the Municipal Leadership and the Veterinary Services.

Vaccination of livestock appears to be the only available method to control the disease, and to break the chain of infection. Vaccination will eliminate abortion, the leading cause of environmental contamination and new infection. Furthermore, immunity is considered as life-long (3, 8), but revaccination is possible without harm (6). As with "S 19", "Rev 1" occasionally is shed in the milk of vaccinated animals, but this is not of public health significance (8, 10).

A successful vaccination program will ultimately lead to disease eradication measures. This is the goal of the 5-year plan established in 1986 by the Department of Animal Health and Production. It mandates control of Brucellosis through vaccination, and recommends the use of "Rev 1" vaccine for sheep and goats, and "S 19" vaccine for cattle.

Besides vaccination, other control measures are envisaged. They aim to control the sale of dairy products, the imposition of appropriate quarantine regulations when there is need of importation from abroad, improved farm and dairy hygiene, and public education. Public education addresses the boiling of milk, and milk products before use.

Literature

(1) Abdul Aziz, N. (1986). Brucellosis in Animals of Jordan, Bull. Cons. Med. Labs., Vol 4, (3): 3.

(2) Acha, P.N., Szyfres, B. (1987). Zoonoses and Communicable Diseases Common to Man and Animals, Pan American Health Organization, Scientific Publication No. 503: 24-45.

(3) Alton, G.G. (1987). Control of Brucella Melitensis Infection in Sheep and Goats - A Review. Trop. Anim. Hlth. Prod. 19: 65-74.

(4) Ministry of Agriculture, Jordan (1988). Annual Report of the Epidemiology and Production Monitoring Section.

(5) Dajani, Y.F., Masoud, A.A., Baraket, H.F. (1989). Epidemiology and Diagnosis of Human Brucellosis in Jordan: J. Trop. Med. and Hygiene, 92: 209-214.

(6) Fensterbank, R. (1986). Brucellosis in Cattle, Sheep and Goats. OIE, 54th General Session, Paris 26-30 May 1986: 1-19.

(7) Meyer, M.E. (1989). University of California, Davis. School of Veterinary Medicine. Department of Epidemiology and Preventive Medicine. Personal Communication.

(8) Nicoletti, P. (1982). Diagnosis and Vaccination for the Control of Brucellosis in the Near East. The FAO Technical Paper 38.

(9) Schenkel, F., Abdel Aziz, N. (1978). Brucellosis Surveys in Jordan (1977-1978). A Preliminary Report: Colloquy on Control and Eradication of Brucellosis, Nicosia, Cyprus: 35-44.

(10) WHO (1981). A Guide to the Diagnosis, Treatment and Prevention of Human Brucellosis, VHP/81.31.

(11) WHO (1986). Joint FAO/WHO Expert Committee on Brucellosis. Sixth Report, Technical Report Series 740.

(12) Sackmann, W. (1954). Zur Ausscheidung von Stamm Buck 19 aus dem Kuheuter. Schweizer Arch. tierheilkunde. 96: 57.

(13) Nicoletti, P. (1980). The Epidemiology of Bovine Brucellosis. Advances Vet. Sc. and Comp. Med. 24: 69-98.

Table I. Summary of Brucellosis Prevalence in Jordan 1987 and 1988

		Sheep	Goats	Sheep/Goats
1987	Total No. Sera examined	3,397	1,272	4,669
	Total positives (CFT)	11%	6%	9%
1988	Total No. Sera examined	1,516	1,195	2,711
	Total positives (CFT)	9%	5%	7%

Table II. Prevalence of Brucella Antibodies in Sheep and Goats 1987-1988* (7,380 Serum Samples. Test method: CFT)

Results by Agricultural Directorates

Agricultural Directorates	Negative Samples		Positive Samples		Total No. of Samples
Ajlun	285	94.1%	18	5.9%	303
Amman	706	87.8%	98	12.2%	804
Balqa	830	93.7%	56	6.3%	886
Irbid	307	89.8%	35	10.2%	342
J. Valley	680	94.2%	42	5.8%	722
Jerash	117	91.4%	11	8.6%	128
Karak	889	91.9%	78	8.1%	967
Ma'an	478	95.8%	21	4.2%	499
Madab	487	87.7%	69	12.4%	556
Mafraq	340	79.4%	88	20.6%	428
Tafila	1,039	95.2%	52	4.8%	1,091
Zarka	589	90.1%	65	9.9%	654
Column Totals	6,747	91.4%	633	8.6%	7,380 100%

* Evidence from non-vaccinated flocks

Table III. Sheep and Goat Disease Data 1987/88

Disease	Total of Sera		Number positive	Per cent positive	Diagnostic test
Brucellosis	7,380	*	633	8.6%	CFT, SAT, RBT
Q. Fever	8,534		256	3.0%	CFT
Chlamydiosis	8,534		682	8.0%	CFT
Leptospirosis	4,395		44	1.0%	CFT
Toxoplasmosis	279		47	17.0%	IFAT
Blue Tongue	801	**	152	19.0%	IGIDT
CAE	801	**	0	0.0%	IGIDT
Mycopl. agal.	3,647		5	0.14%	CFT
Mycopl. mycoid	2,081		2	0.10%	CFT
Mycopl. capri	1,352		0		CFT (strain F38)
Babesiosis	8,161		2,040	25.0%	ELISA

* Rev1 unvaccinated animals

** Belonging to 81 flocks

Table IV. Viability of Brucella Bacteria in Milk and Dairy Products (12)

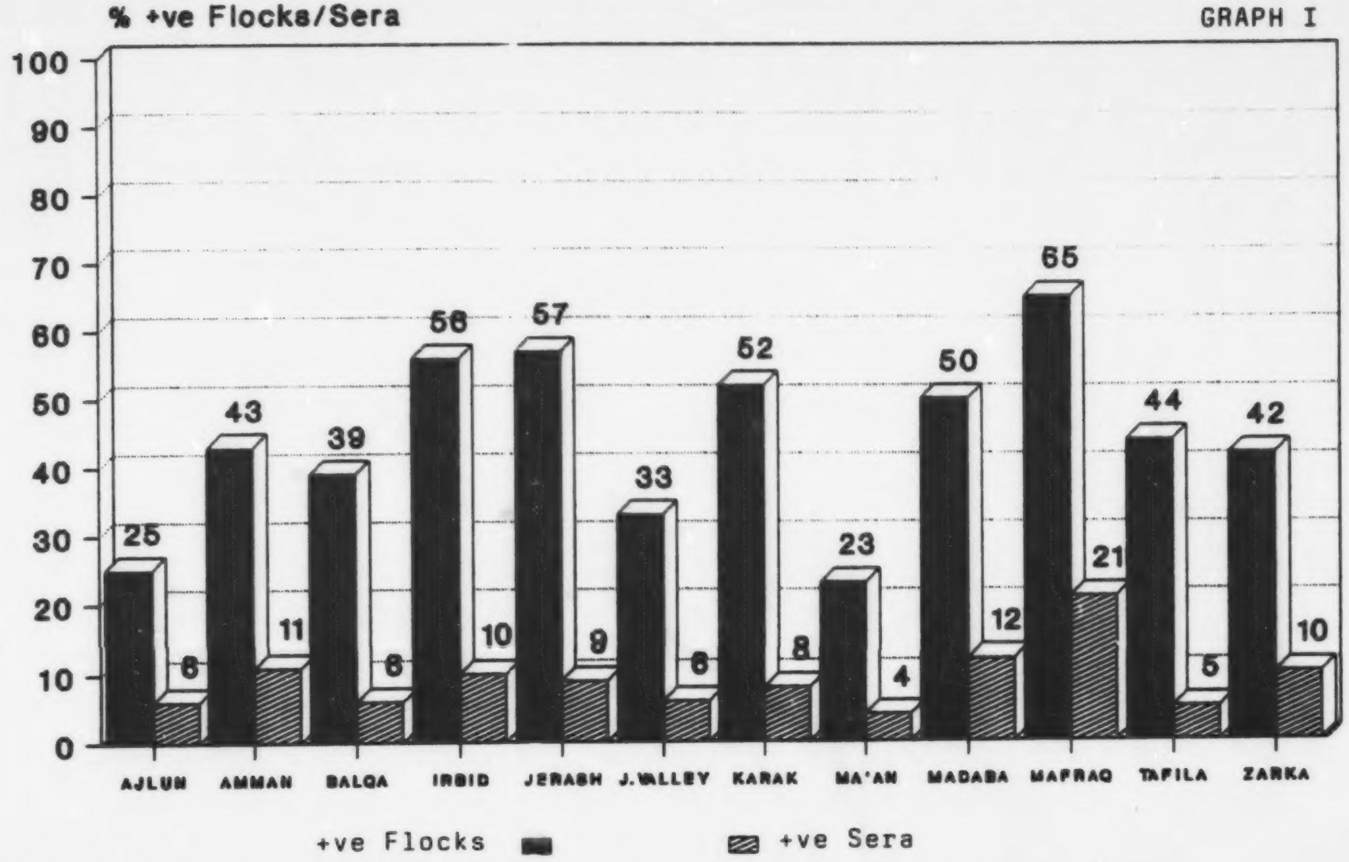
		Visibility of B. abortus		
	Storage Temp. °C	Drescher and Hopfengartner	Lerche	Transmissability
		Days	Days	
Milk artificial inoculation with B. abortus	8	-	8-10	yes
Milk	8-10	21	-	yes
Whipped Cream	-	-	4	yes
Cream (sweet)	4-5	37	-	yes
Sweet Cream Butter from inoculated Milk			45 25% of Bacteria	yes
Butter from separating the cream by centrifugation			40	yes
Sweet Cream Buttermilk	4-5	30	-	yes
Sour Cream Buttermilk	4-5	9	-	yes
White Cheese cottage type from inoculated Milk			24	yes
Soft Cheese (Delicatessen) 35-day ferment	18	35	-	yes
Semi-soft Cheese (Tilsiter) 92-day ferment		from start of ferm. 31-90	-	no
Hard Cheese (Emmenthaler)	-	49	-	no

Table V. Summary of Results of Selected Trials on Survival of *B. abortus* (13)

Medium	Temperature/environment	Viability
Sunlight	< 31°C petri dish	4.5 Hours
Water	- 4°C	114 Days
Water	Room	77 Days
Water, lake	37°C pH 7.5	< 1 Day
Water, lake	8°C pH 6.5	>57 Days
Soil	Room dried	< 4 Days
Soil	Cellar wet	66 Days
Soil	Autumn 90% humidity	48-73 Days
Manure	Summer	1 Day
Manure	Winter	53 Days
Manure	158-170°F pit	< 4 Months
Manure, liquid	Summer	108 Days
Manure, liquid	Winter	174 Days
Slurry	Tank	7 Weeks
Slurry	12°C tank	> 8 Months
Slurry	12°C tank + 1000 ppm xylene	< 1 Month
Saliva, sheep		20-24 Hours (Strain 19)
Abdominal fluid, sheep		10-30 Minutes
Wool	Warehouse	110 Days

GRAPH I

SERA PREVALENCE OF BRUCELLOSIS
in 385 Non-Vaccinated SHOAT Flocks 87/88
(7380 Serum Samples Examined by CFT)

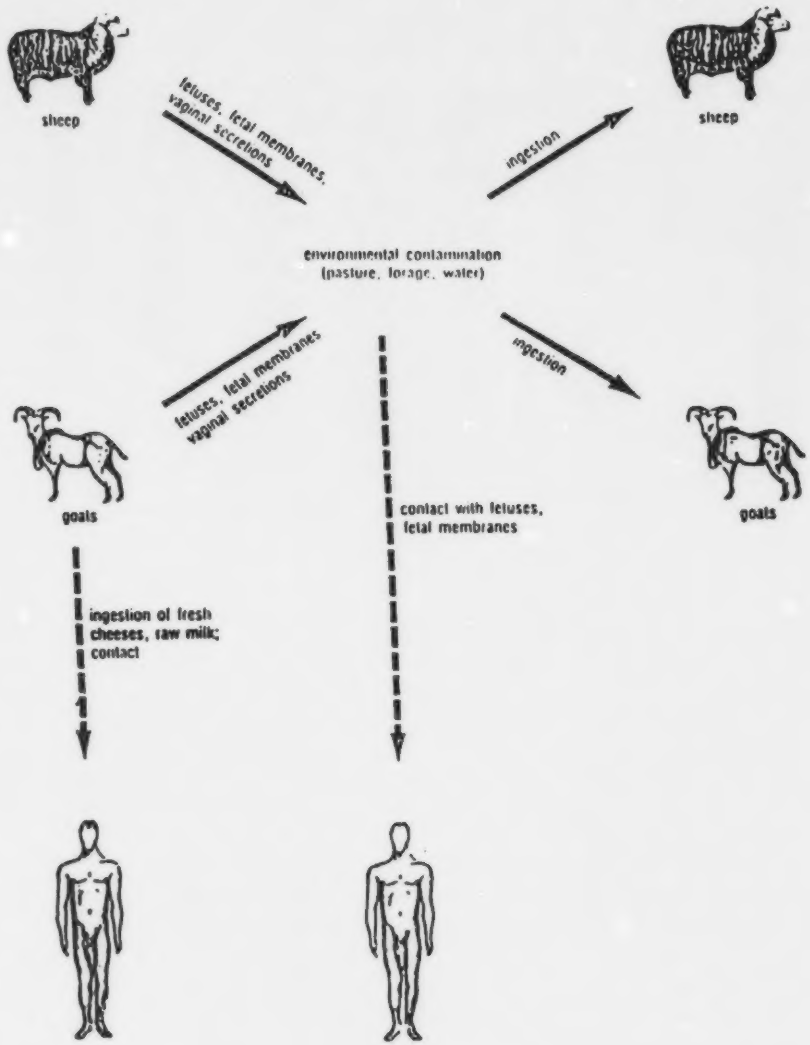


AHI Serology Section/EPM Division Oct.89

selact89

GRAPH II

Caprine and ovine brucellosis (Brucella melitensis). Mode of transmission. (2)


sheep
fetuses, fetal membranes, vaginal secretions
ingestion
sheep
environmental contamination (pasture, forage, water)
fetuses, fetal membranes, vaginal secretions
ingestion
goats
goats
contact with fetuses, fetal membranes
ingestion of fresh cheeses, raw milk; contact

UPDATE OF EPIDEMIOLOGY AND DIAGNOSIS OF BRUCELLOSIS IN JORDAN

Yahia, F., Dajani, M.D. and Abdel Aziz Masoud, M.S.C.

Consulting Medical Laboratories,

P.O. Box 35198, Amman, Jordan

Prior to 1985, brucellosis was unrecognized as a health problem, so that in the WHO report of 1981, no cases of human brucellosis were reported from Jordan. Two human cases documented by positive serologic reaction (chewy 1/2560 and 1/640) in Zerka go back to 1977. In Jordan the first strains of B. melitensis in humans were cultured in September 1985(3). Animal studies date back to 1971 in Jordan (4). Current figures estimate the level of infection in sheep and goats at 10% and in cattle 2%. A 5-year vaccination program commenced on April 1, 1986, for sheep and goats only. To date no Brucella has been cultured from animal livestock in Jordan.

Awareness of human brucellosis began in late 1985 and soon notification to the Ministry of Health mounted. News media then amplified the tissue, while the authorities communicated hygiene to readers, listeners and viewers all over the country. Epiderniologic studies have been very limited, but occurrence of the disease in humans has been documented during the past three years indicating that brucellosis is widespread and endemic in Jordan. The pattern of the disease has now become well established.

Panel 1 shows three consecutive annual cycle (1986-1988) with similar seasonal frequency pattern, confirmed in a subpopulation at the Consulting Medical Laboratories. In Panel 2, the minimal monthly incidence rates support a seasonal incidence for brucellosis. The estimates are believed to be below the actual incidence rates, but they ascertain a characteristic pattern for occurrence of the disease suggesting that the prevalence is still maintained with no evidence of decrease as yet in response to control measures undertaken, namely, health education campaigns, and, more importantly the animal vaccination program. True incidence rates are very difficult to estimate because of the level of infection in people who are out of reach. Furthermore, we have evidence to show that notification from urban zones is not operating efficiently in any way - for example, notifications to the Ministry of Health during the week July 15-21 numbered three and one from Amman and Zerka, respectively, whereas at the Consulting Medical Laboratories alone the corresponding numbers were six and seven cases during the same period.

Some have proposed that brucellosis is presently on the decrease in Jordan, but the evidence negates such a statement. In Table 1, we find that the minimal incidence rates in 1987 and 1988 were similar with no sex difference and no significant change during this period of time. Table 2 supports the preceding statement and confirms that during January - August 1988 the frequency of cases seen in each selection may interfere with these results. The valid point remains that we are still seeing the disease without evidence of diminishing frequency.

In Table 3, 16 Brucella strains show cross reaction with Salmonella O antigens as follows: 9 S. Typhi alone (56%), 2 S. typhi + S. paratyphi A (11.5%), 3 S. paratyphi A alone (21%) and 2 S. paratyphi B alone (11.5%). Previous studies report cross reaction with several other organisms(2).

In Table 4 we not 42% resistance rate to cotrimoxazole. We believe that it is due to indiscriminate use of this drug(3). Ofloxacin was noted for the first time to be an effective anti-brucella agent in vitro(2). This is supported by a preliminary in vivo study published in this edition of the Bulletin(9).

Acknowledgment

The authors thank Dr. S. Qubain, Dr. S.A. Al-Jitawi and other colleagues without whose help this study could not have been possible.

References

1. World Health Organization. A guide to the diagnosis, treatment and prevention of human brucellosis, Geneva, 1981.

2. Dajani, Y.F., Maoud, A.A., Baraket, H.F. Epidermiology and diagnosis of human brucellosis in Jordan. Journal of Tropical Medicine and Hygiene 1989; 92: 209-214.

3. Dajan, Y.F. and Halabi, M.K. 19 culture positive cases of brucellosis in Jordan. A pilot study. Bulletin the Consulting Medical Laboratories 1986; 4(3) 1-2.

4. Abdel Aziz N. Brucellosis in animals of Jordan. Bulletin of the Consulting Medical Laboratories. 1986; 4(3): 3.

5. Malhas, Z. Brucellosis today. Bulletin of the Consulting Medical Laboratories.

6. Baraket, H.F. and Maoud, A.A. Serology positive brucellosis in Jordan. Preliminary report. Bulletin of the Consulting Medical Laboratories. 1986; 4(3); 1-2.

7. Working Team on Brucellosis. Follow up data on brucellosis. Bulletin of the Consulting Medical Laboratories. 1986; 4(4): 1.

8. Working Team on Brucellosis. Brucellosis revisited. Bulletin of the Consulting Medical Laboratories. 1987; 5(3): 4.

9. Hadidi, A.R. Ofloxacin: New drug for brucellosis. Bulletin of the Consulting Medical Laboratories. 1989; 7(4): 1.

PREVALENCE OF TOXOPLASMA ANTIBODIES IN IRAQI PREGNANT WOMEN IN BAGHDAD

A.D. Naizi[1]; A.R. Omer[2]; T.S. Al-Hadithi[3] and A. Aswad[2]

Key Words: Toxoplasmosis--Iraq, Seroepidemiology, ELISA

Summary

Sera from 726 pregnant women attending MCH centers in Baghdad, Iraq were tested for the presence of toxoplasma antibodies using an enzyme-linked immu-nosorbent assay (ELISA). Nearly 39% of examined women were found to have IgC protective antibody. A non-significant rising prevalence with age was demonstrated.

The titers of toxoplasma antibodies were generally low. The study suggests that around 60% of women are susceptible and may acquire the infection during pregnancy. Infection acquired during pregnancy should be diagnosed and pregnant women must be treated in order to reduce the incidence of congenital toxoplasmosis.

Introduction

Toxoplasmosis is one of the most common infections of animals and man, producing a variety of clinical manifestations in humans.[1] Toxoplasmosis in man may occur as a congenital or as an acquired infection. Individuals in close contact with oocyst-excreting cats; or those dealing with or consuming raw meat, are at a greater risk of acquiring an infection than the general population.

---

[1] Directorate General of Health Research, Ministry of Health.

[2] Central Public Health Laboratory, Ministry of Health.

[3] Department of Community Medicine, Medical College, University of Baghdad.

Congenital infection can occur only when a woman has primary exposure during pregnancy. Tranplacental transmission from a chronic infection is believed not to occur. Infection prior to conception is considered to provide protection against the birth of a child with congenital toxoplasmosis.[2] The severity of congenital infection depends on the duration of infection of the fetus. Acute infections during the first trimester carry the greatest risk of severe disease at birth[3] while late trimester infections tend to be subclinical at birth but clinical symptoms may develop in later life.[1] Serological surveys have shown that the prevalence of toxoplasmosis infection in women of child-bearing age in Baghdad have low rates[10, 11], although prevalence rates were found to be higher among the Iraqi general population.[12, 14]

The present study investigates the prevalence of toxoplasma infection among Iraqi women of child-bearing age in Baghdad using an enzyme-linked immunosorbent assay (ELISA) for detection of toxoplasma IgG. The application of ELISA to the diagnosis of toxoplasmosis has been described by various authors, who demonstrated an excellent correlation between ELISA, indirect fluorescent antibody (IFA), indirect haemagglutination (IHA) and Sabin-Feldman dye test (DT).[15-18].

Materials and Methods

Blood samples were obtained from 726 pregnant women (16-45 years of age) at their third trimester of pregnancy attending MCH centers in Baghdad. Sera were separated from clotted blood by centrifugation and stored at -20°C until tested for the presence of toxoplasma IgG by enzyme-linked immunosorbent assay (ELISA). Serum testing was carried out at the Central Public Health laboratory, Baghdad, using a commercially available diagnostic kit (Toxonoslika IgG - Organon OSS).

ELISA values were converted into titers and an antibody titer of $1/\geq 100$ was considered positive.

The variables were analyzed by Chi-square and analysis of variance and values of $P < 0.05$ were considered as statistically significant.

Results

The overall prevalence rate of toxoplasma antibodies in Iraqi women of child-bearing age was 38.8%, with a range of 33.8-48.5% (Table 1). No statistical difference was demonstrated among different age groups ($P < 0.05$>

Table 1. Age distribution of prevalence of Toxoplasma antibodies in pregnant women

Age group (years)	No. tested	No. positive (%)
< 20	125	45 (36.0)
20-24	204	69 (33.8)
25-29	140	54 (38.6)
30-34	120	52 (40.6)
35-39	66	32 (48.5)
40+	63	30 (47.6)
Total	726	282 (38.8)

Table 2. Distribution of positive Toxoplasma antibodies and geometric mean of positive titers (GMT) in various age groups of pregnant women

Age group (years)	No. of patients with positive titer (1/≥100)	No. of patients with a titer of:						
		1/100	1/200	1/400	1/800	1/1600	1/≥3200	GT
< 20	45	13	6	16	4	5	1	1/317
20-24	69	13	23	10	17	3	3	1/337
25-29	54	5	17	23	6	2	1	1/334
30-34	52	10	11	12	12	6	1	1/379
35-39	32	7	6	9	8	1	1	1/343
40+	30	9	6	7	4	3	1	1/310
Total	282	57	69	77	51	20	8	1/338

The geometric mean of positive titers (1/≥ 100) was 1/338. The distribution of positive antibody titers and their geometric means in various age groups of pregnant women is shown in Table 2. Analysis of variance revealed that the geometric mean titers are not statistically different among the age groups ($P > 0.05$).

Discussion

The overall prevalence of 38.8% is higher than that previously reported among Iraqi women of child-bearing age, 3% and 6% using IFA[10, 11]. The later rates seem not to coincide with rates reported among the Iraqi general population. Using toxoplasmin skin test, prevalence rates of 20.5% and 12.3% were reported.[12, 13] Studies using IHA and IFA have detected toxoplasma antibodies in 27.6% and 23.1% of Iraqi general population, respective.[14]

The prevalence rate reported in this study, however, is comparable to that reported among Arab women of child-bearing age in neighbouring countries (31.2% in Jeddah,[4] 38.6% in Riyadh, 42.1% in Dammam,[5] Saudi Arabia and 31% in Amman, Jordan[6]) despite the use of different techniques, whereas the rate is higher than that reported in New York (32%[7]) and London (22%[8]), but much lower than the prevalence rate among women of child-bearing age in Paris (84%[9]). This is probably because for more raw or undercooked meat is consumed by French people.

Increasing prevalence of positive serological reactions with increasing age, although it does not reach the conventional level of 5% of significance, has also been reported by other workers.[14, 19, 20] The GMT of positive toxoplasma titers in pregnant women of different age groups indicated a relatively low level of circulating toxoplasma antibodies as may be expected in the latent chronic infection, although few women had high titers which may indicate acute infection. The variations in antibody titers among various age groups were of no significance.

The study suggests that, although 38.8% of women possess immunity to toxoplasma infection, around 60^ of women are susceptible and may acquire the infection during pregnancy. Pregnant women should not eat raw meat (not even taste a sample during preparation for cooking) and hand washing with soap and water after handling meat is essential. Pregnant women should preferably avoid handling cats and contact with materials that are contaminated with cat faeces.

Studies have shown that treatment of primary maternal infection during pregnancy can reduce the incidence of congenital infection by 50-70%.[23-23] Thus early serological diagnosis of acquired toxoplasmosis during pregnancy and immediate treatment of pregnant women are vital. Recent infection can be confirmed by ELISA or IFA, which detect antibodies of IgM class.

Further studies in Iraq are needed to determine the rate of congenital toxoplasma infection among newborn infants using IgM class ELISA specific to toxoplasma.

References

1. Redmington, J.S. and Desmonts, G. Toxoplasmosis in Remmington, J.S., Klein, J.O. (eds.): Infectious disease of the fetus and newborn infant. Philadelphia, WB Saunders, 1976, 191-332.

2. World Health Organization. Parasitic Zoonosis-Toxoplasmosis Techn. Rep. ser, 1979, 637, 35-39.

3. Desmonts, G. and Couvreur, J. Toxoplasmosis in pregnancy and its transmission to the fetus. Bull, NY acad Med, 1974, 50, 146-153.

4. Basalamah, A.H. and Serebour, F. Toxoplasmosis in pregnancy: A survey of 1,000 pregnant Saudis and non-Saudis attending King Abdulaziz University Hospital, Jeddah. Saudi Med J, 1981, 2, 125-130.

5. ali Abbas, S.M., bassalamah, A.H., Serbour, F.E. and Atonso, M.R. The prevalence of Toxoplasmagondii antibodies in Saudi women and the outcome of congenital infection among newborns in Saudi Arabia. Saudi Med J, 1986, 7, 346-354.

6. El-Kahteeb, M.S. A study of Toxoplasma antibodies in Jordanian adults. Jordan Med. J, 1980, 14, 145-148.

7. Kean, B.H. Clinical toxoplasmosis - 50 years. Trans Roy Soc. Trop Med Hyg, 1972, 66, 549-567.

8. Rouss, G.F. and Bourne, G.L. Toxoplasmosis in pregnancy. J. Obstet Gynaecol Brit Comm. 1972, 79, 1115-1118.

9. Desmonts, G., Couvreur, J. and Ben Rashid, M.S. Le toxoplasmeala mere et 1 enfant. Arch Franc Pediat, 1965, 22, 1183-1200.

10. Tawfiq, H.S. Preliminary study for Toxoplasmosis during pregnancy in Iraq. Bull Endem Dis, 1983, 22-23, 63-68.

11. Kubba, K., Al-Taie, I.D., Al-Obaidi, A. and Tawliq, H.S. A study of Toxoplasmosis in pregnancy in Iraq. Irq Med J, 1986, 34, 9-14.

12. Najim, A.T. and Al-Saffar, G. Sensitivity of Iraqis to the Toxoplasmin intra-dermal test. Z. Tropenmed Parasit, 1961, 12, 419-421.

13. Niazi, A.D. Prevalence of Toxoplasmosis in Iraq. Bull Endem Dis, 1976, 17, 7-35.

14. Jasim, A.N. Seroepidemiological studies on toxoplasmosis in Iraq, evaluation of serological tests used in diagnosis, 1979. Msc. thesis. Baghdad University.

15. Voller, A., Bidwell, D.E., Bartlett, A., Fleck, D.G., Perkins, M. and Oladehin, B. A microplate enzyme immunoassay for toxoplasma antibody. J. Clin Pathol. 1976, 29, 150-153.

16. Walls, K.W., Bullock, S.L. and English, D.K. Use of the enzyme linked immunosorbent assay (ELISA) and its microadaptation for the diagnosis of Toxoplasmosis. J. Clin Microbiol, 1977, 5, 273-277.

17. Ruitenberg, E.J. and Knapen, F. Van. The enzyme linked immunosorbent assay and its application to parasitic infections. J Infect Dis, 1977, 136, 267-273.

18. Carlier, Y., Bout, D., Dessaint, J.P., Capron, A., Knapen, F., Ruitenberg, E.J., Berguist, R. and Huldt, G. Evaluation of enzyme-linked immunosorbent assay (ELISA) and other serological tests for the diagnosis of toxoplasmosis. Wld Hlth Org, 1980, 58, 99-105.

19. Fleck, D.G. Toxoplasmosis. Public Health (London). 1969, 83, 31.

20. Jackson, M.H., Hutchison, W.M. and Sim, J. Chr. A seroepidemiological survey of toxoplasmosis in Scotland & England. Ann. Trop. Med. Parasit, 1987, 81, 359-365.

21. Kraubig, H. Preventive Behandling der Konnatelen toxoplasmose. In: Kirchoff, H. Kraunbig H., eds. Toxoplasmose: Praklishe fragen and ergebisse Stuttgart, Gerog Thieme Verlog, 1966, 104-122.

22. Desmonts G. and Courvreur, J. Congenital toxoplasmosis: Prospective study of 387 pregnancies. N. Eng J Med, 1974, 290, 1110-1116.

23. Desmonts, G. and Couvreur, J. Congenital toxoplasmosis: A prospective study of the offspring of 542 women who acquired toxoplasmosis during pregnancy. Pathophysiology of congenital disease. In: Thalhammer, O., Baumgarn, K. and Pollack, A. eds. prenatal medicine. Sixth European Congress, Stuttart: Gerog Thierne Publishers, 1979, 51-60. Cited in Ali Abbas et al.[5]

PAPER ON HEALTH SYSTEMS RESEARCH AND RABIES CONTROL
to be presented by Dr. K. de Balogh APO/VPH at the
Pan-Arab Seminar on Zoonotic and Parasitic Diseases
in Amman, Jordan from 17-19 October 1989

I. Health Systems Research

Introduction

WHO recognizes that health is more than the mere absence of disease. Health is a state of complete physical and mental well-being. These concepts indicate that health is not something that can be achieved or maintained exclusively through the health services. As health is profoundly influenced by conditions of life (e.g., lifestyle, social and physical environment), these must be taken into consideration in the search for means to assure or improve human health.

Health for all is the ultimate goal and Health Systems Research (HSR) is one of the managerial tools to achieve this. Decision makers involved in the development of national health systems should be trained to use health systems research to make decisions and choose between alternative solutions. A basic step in HSR involves identification of the existing structures and influences related to human health. Relevant scientific disciplines and social studies are used to obtain information and knowledge about local realities. Problems are identified and given an order of priority according to the available resources. If a priority problem has no ready scientific solution, research has to be initiated. An understanding of the causes and the overall situation can help in choosing the appropriate methods for investigation. Asking the right questions is the very basis of all good research.

HSR can be distinguished from basic research by its direct focus on solving practical and relevant problems, linking field realities so that the results can be directly and rapidly applied. HSR goes beyond government programs. It involves the private sector, traditional health practitioners and the community, and the analysis of intersectoral influences. The target group or community should be involved in setting realistic objectives and selecting intervention programs so that appropriate solutions to local problems can be found. HSR set out to achieve optimum results at minimum cost, to increase the capacity of people to solve their own problems by creating self-reliance rather than dependence, and to achieve a balance between the needs and the resources of a country.

The interest and commitment among the health sector decision makers to encourage research and communication between researchers and those that use the results form the basis for HSR. Intersectoral collaboration, i.e., involvement of different social and professional groups from the national to the local level, can be particularly important in the control of zoonotic diseases. In most countries, at least two ministries (agriculture and health) are currently responsible for the identification and control of zoonoses. A constant flow of information between the two ministries will facilitate the early detection of problem areas, and action should be coordinated. Other ministries, like education and communication or mass media, responsible for public education, should also be involved.

Rabies control and the latest research results are used here as a practical example to illustrate HSR.

II. Rabies

Rabies, a fatal disease for man and animals, has been reported in 108 of 156 countries and territories providing data to the FAO/OIE/WHO Animal Health Yearbook 1988. Although an effective vaccine is available, only a few countries have been successful in controlling or eliminating rabies from their territories and preventing reintroduction of the disease. The high frequency with which human post-exposure treatment is applied annually, especially in developing countries, represents a large burden for health budgets. It is estimated that 25,000 persons die of this terrible disease every year. In places where no post-exposure treatment is available, people suffer from fear and uncertainty after exposure to a suspected rabid animal.

Different methods and approaches have been used in an attempt to control the disease, but with unsatisfying results in many cases. The first step in the application of HSR for rabies control is to analyze ways to achieve the reduction or elimination of rabies and to identify problem areas or "hot spots". Practical research is proposed for these problem areas in order to find adequate solutions for each specific context.

As the ultimate target is to avoid human cases of rabies, several approaches can be applied either simultaneously or successively:

1. Reduction of the number of rabid animals:

    a) reduction of the reservoir species
        - removal
        - productivity control
        - habitat sanitation

b) reduction of the contact rates between susceptible animals
   - movement restriction
   - immunization

2. Improved post-exposure treatment of persons exposed to a suspected rabid animal

3. Prophylactic immunization of humans against rabies. In view of the high costs of the vaccine, this measure is so far only applicable to high risk groups, e.g., veterinarians, laboratory personnel working on rabies vaccine production or diagnosis, vaccinators.

Elimination of reservoir species
In Sri Lanka extensive dog elimination operations have been performed systematically since 1977. In spite of the large number of dogs destroyed (35-50,000 dogs/year) this represented only 5% of the total dog population. Retrospective analysis of data from Guayaquil, Ecuador, between 1980-1985 shows that even elimination levels ranging between 12-25% of the estimated dog population neither durably affected the size of the target population and nor did they reduce the incidence of canine rabies. Higher puppy survival due to the availability of food and shelter after these massive dog elimination campaigns led to the failure of this method. Dog removal programs have been shown to be ineffective and cause opposition of the community towards the rabies control program. Productivity control through neutering or hormonal treatment of productive animals is costly and requires a responsible dog-ownership.

Habitat sanitation could be attained through the reduction of shelter and feeding opportunities for independent dogs. Clearing of waste and inhibiting the access to slaughter premises could be mentioned here.

Reduction of contacts between susceptible animals
Reliable data reflecting the number of human and animal cases, numbers of dog-bites reported and post-exposure treatment given, are indicators for the extent of the disease in geographic and economic terms. If a rabies control program is to be initiated, a political commitment by the government must be reflected in its priority setting and resource allocation.

Movement restriction (e.g., through leashing, tie-up orders for dogs) demand a political commitment for their enforcement.

Prior to the initiation of a vaccination program, the provision of sufficient and good quality vaccine (either through national production or the allocation of foreign exchange for its importation), its distribution and the availability of manpower and equipment must be assured. If this is not the case, the weak points have to be identified and amended. The need for additional training of injectors/vaccinators and persons conducting surveys may be required. Demographic data, human and animal population figures, household distribution and size, as well as maps of the area are important tools for the planning of a control/vaccination program.

Dog ecology studies

To increase the immunization coverage of the dog population, specific research activities have been carried out through AGFUND and Radda Barnen sponsored "Project of Control of Human and Canine Rabies" in Ecuador, Tunisia and Sri Lanka. Dog ecology studies were designed to investigate the relationship between man and dog. The preliminary studies provided information on features of dog population and their accessibility. The results led to new concepts in vaccination and stray dog control policies, applicable also in other parts of the world as well as in the pilot areas.

It was recognized that terms like pet dog, owned dog, community dog, feral dog and stray dog were confusing when applied to individual dogs or dog categories and if translated into different local languages. It was, therefore, agreed to differentiate only between: fully dependent dogs (for dogs which are given their essential needs intentionally by humans), semi-dependent, and independent dogs for dogs without any provision. The terms restricted, semi-restricted and unrestricted relate to different levels of physical and biological liberties of a dog to associate and "communicate" with other dogs. This refers to the confinement of a dog to premises, its use for hunting and herding, and also includes restrictions on reproduction (neutering).

The following categories have been established:

a) restricted (supervised) dog: fully dependent and fully restricted
b) family dog: fully dependent, semi-restricted
c) neighbourhood dog: semi-dependent, semi-restricted
d) unrestricted (unsupervised) dog: semi-dependent, unrestricted
e) feral dog: independent, unrestricted.

Community mobilization

The extent of the dog population and the level of supervision must be examined during the first phase or pilot project of a large scale vaccination campaign. Population estimates and dog accessibility studies using questionnaires and observations can be used for this purpose. Studies in Ecuador and Nepal have indicated that only 15% of the dogs, either owner or not, are not catchable by a person.

The community awareness of rabies, the practices to deal with the disease, and attitude/motivation of the community towards rabies control programs can be identified through surveys. The educational methods available and applicable will be selected according to the available resources, and the habits and level of knowledge/literacy of the people. The availability of radio, television and newspapers in conjunction with the mass media behaviour of the population determines their use for the spread of information concerning rabies. Activities in schools and neighbourhood centres related to the disease and its prevention will enhance the readiness of the community to participate. In addition, the effects of stories, spots, plays and loud-speaker vans in conjunction with the appropriateness of the messages used, will greatly influence the success of the campaign. Specific education programs tailored for influential groups, e.g., veterinary practitioners, government departments, service clubs (Rotary, Lions), school teachers, police, animal welfare and wildlife organizations and environmental lobby groups, are very effective, but depend on the available resources.

The organization of the campaign (vaccination at neighbourhood centres, door-to-door visits, one day campaign) and its implementation and strategy (time of day, i.e., after people return from the fields or children come home from school; mobile or fixed; use of incentives) may have a considerable influence on the proportion of dogs brought for vaccination. Marking of vaccinated dogs is essential for their later identification. If collars are used they should be cheap, durable, not harmful, not easily removed and with no alternative use.

For successful rabies control a total dog population vaccination level of 80% is desired. Following each campaign the coverage can be determined by comparing vaccination records to dog population size or by a separate survey. Repeat vaccination campaigns should be conducted when the population vaccination level drops below 60%. In many areas annual vaccination must be conducted to reach a successful control or eradication of the disease.

Oral vaccination

Oral vaccination of foxes was first applied in nature on an island in the Leman Lake in 1978 in Switzerland. Following that trial, the use of the technique was progressively extended to all infected areas of the country. By the end of 1986 rabies cases were only reported in border areas. Long research had come before obtaining an appropriate bait and a safe and potent oral vaccine. Several research groups are currently working on the development of a bait and an oral vaccine for dogs. This would be especially useful for the vaccination of dogs that are not accessible for parental immunization.

The fox vaccine preparation is unsuitable for immunizing dogs as a vaccine titer at least 10 times higher than for foxes is required. The bait has to be appealing to all age groups and sizes of dogs and be unattractive to non-target species.

The efficacy of the vaccine and its release in the oral cavity must not be hampered by the bait. The use of locally available material for bait production would assure their availability and lower costs. A biomarker is to be incorporated for later recognition of the vaccinated animals. The optimal delivery system: selection of placements, methods of distribution (e.g., manual placement, from moving vehicle, hand feeding) and number of baits distributed per area have to be assessed and evaluated through bait uptake estimates.

The vaccine should be incorporated into the bait in a sterile form and should still produce a satisfactory level of immunity in the target animal after exposure to temperature changes, rainfall and ultraviolet light. It is important that existing human pre- and post-exposure treatment is also effective against the strain used in case the virus is excreted through the saliva of the vaccinated animal.

The advantages of an oral vaccine over the injectable rabies vaccines are: easier access to semi- and unrestricted dogs and a reduced risk of handlers being bitten. Less equipment (syringes) and fewer skills (injection technique, dog handling) are required. However, the accessibility of baits for people, especially children, is a problem. It is of utmost importance that the vaccine strain is safe for humans in case unintentional contact or ingestion occurs.

New developments for post-exposure vaccines

Post-exposure treatment (PET) in humans with nervous tissue origin (NTO) vaccines produces serious reactions in about 1 out of 2,000 recipients. Vaccine of tissue culture origin are safe, free from grave adverse reactions, potent and should replace NTO products wherever feasible. When highly potent vaccines are used, shorter vaccination schedules have been shown to be as effective as the recommended "Essen" post-exposure treatment of 5 injections applied on days 0, 3, 7, 14 and 30. These reduced regimes (e.g., 2-1-1 used routinely at the Institute Pasteur in Paris, Zagreb Institute and in Thailand or the still experimental 3-1, 3 applications on day 0 and one on day 7) require fewer vaccine doses than the Essen schedule. This means a reduction in the costs involved and fewer visits by the patient to the vaccination centre. Therefore, the costs of the PET will be cheaper for the patient.

The efficacy of the multisite intradermal application of potent cell culture vaccines is being evaluated in Thailand. Only one dose (1 ml) is needed for a complete PET. However, the intradermal injection requires specific equipment and a skilled person for its application.

Prophylactic rabies vaccination
As already mentioned the costs involved in a prophylactic vaccination of the human population would not be feasible. Therefore only risk groups or persons bearing their own costs are eligible for this vaccine.

III. Conclusion

Health Systems Research in conjunction with operational research can provide the essential basis for the identification and mobilization of all human and material resources in the spirit and practice of intersectoral collaboration and community participation.

Which are the civic groups and individual citizens interested and willing to participate in rabies control programs? What are their expectations from the governmental services? What can be provided through the district services and how can their functions be properly integrated into the national surveillance schemes and vaccination policies?

As shown for rabies, Health Systems Research can be used as a tool for the identification of problem areas that have so far hampered rabies control, and propose useful research to overcome difficulties.

The dog ecology studies provide a clear picture of the human-dog relation and the reason for failure of dog elimination campaigns in many countries. Further, the development of a safe and effective oral vaccine against rabies and a highly accepted bait would greatly improve the vaccination coverage of the dog population.

The careful planning of programs, with a better understanding of man-dog interaction and an active involvement of the community in vaccination campaigns in conjunction with a more effective and cheaper post-exposure treatment for humans, is a step forward in the elimination of rabies in man and animals.

Finally, it should be noted that certain studies (e.g., dog ecology and accessibility studies) can be used for similar control programs, as, for example, in Echinococcosis/Hydatidosis control.

RABIES AND RABIES POST-EXPOSURE PROPHYLAXIS

In Amman Governorate - Jordan

Dr. Fathy Saleh

Public Health Department, Amman Directorate of Health,

Ministry of Health, Amman, Jordan

It is well known that rabies is prevalent in Jordan since a long time. Many people, especially bedouins and residents of rural areas are aware of the danger of this viral zoonosis although rabies is not considered a major threat to human life. The evaluation of official statistics in Jordan shows only few mortalities in humans due to rabies. My impression is that these statistics are by no means representative and I had the opportunity to ascertain this impression during the collection of data for the present paper.

Few cases of human rabies are reported but not registered due to various reasons and so they do not show in the official statistics. Most probably, more cases of rabies in man are not reported because they were not diagnosed as such. Because human rabies is rare in Jordan, the diagnosis is especially difficult in the absence of an exposure history, and few cases of rabies would be diagnosed as encephalitis or meningoencephalitis.

The situation of rabies in animals in Jordan is not well known, and so far no surveys were carried out to identify the different types or reservoirs for rabies virus.

The laboratory diagnosis of rabies in animals is centralized in Amman at the Jordan Vaccine Institute.

Since 1981, diagnosis of rabies is done by immunofluoresence and serological tests. The fluorescent antibody test for detection of rabies antigen is the quickest and most reliable method available, both for diagnostic and research purposes.

In 1981, the Ministry of Health introduced the Cell Culture Vaccine "Human Diploid Cell Vaccine" for rabies post-exposure prophylasix. Rabies post-exposure prophylaxis is centralized at the public health department of each governorate. In Amman governorate, it is carried out at the public health department of "Amman Health Directorate". The cost of human diploid cell vaccine and specific gammaglobulins of human origin, used for rabies post-exposure prophylaxis in Jordan during the first eight months of 1989 amounted to the sum of 45 thousand Jordan Dinars and expected to reach the sum of 70 thousand J.D.s by the end of the year.

Animal Rabies

Statistics on animal rabies are derived from the number of tissue specimens submitted to the Vaccine Institute in Amman and proved positive by immunofluorescent antibody test.

These represent only a fraction of those occurring in wildlife. Because the animals examined are in fact a group of highly suspected animals involved in biting incidents, the proportion of those proven to be rabid is excessively high, Table "I", and does not represent the real situation.

Most wild animals involved in biting incidents and examined by laboratory tests were found to be rabid, and as a result we should consider wild animals attacking humans in urban and peri-urban areas as rabid unless proved otherwise.

Because the numbers shown in Table "II" and Table "III" are so few and the group of animals from which they are drawn is not representative, it is not possible to submit them to any meaningful analysis. Nevertheless, it is useful to consider the following two points:

1 - In Jordan it seems that canine rabies is the most prevalent with foci of wildlife rabies "foxes, hyaena, wolves, etc. ...".

Table I. Number of animals examined for rabies at the Vaccine Institute during 1983-1988 in Jordan

Year	1983	1984	1985	1986	1987	1988
Number of animals examined	52	24	34	24	18	20
Number of animals found infected	21	4	12	5	5	5
% of infected animals	40%	17%	35%	21%	28%	25%

* Using immunofluorescent antibody test

Table II. Number of animals identified by laboratory tests as rabid, during the period 1983-1988 in Amman governorate

1983	1984	1985	1986	1987	1988
4 dogs	——	2 dogs	1 hyaena	1 wolf	1 fox

Table III. Number of animals identified by laboratory tests as rabid, during the period 1985-1988 in Jordan

Type of animal Year	Dog	Donkey	Wolf	Fox	Hyaena	Cow	Goat
1985	8	1	1	——	——	1	——
1986	1	2	——	1	1	——	——
1987	1	1	2	1	——	——	——
1988	2	——	——	2	——	——	1

2 - Cases of rabies in domestic animals are an overspill from wildlife rabies. Sequences of infection in dogs and cats are very rare and if they occur consist only of a few cases.

In order to identify the different types of reservoirs for rabies virus and the prevailing epidemiological patterns, surveys should be done in domestic and wild carnivores, including stray dogs, cats and possibly rats.

Human Rabies

In Jordan, during the period 1972-1982, eleven cases of human rabies were recorded, thus averaging one case per year. No official statistics were available for the period 1983-1988. In 1985, in Al-Tafila governorate a 25-year-old man died of rabies after he was bitten by a rabid wolf and the incident was widely circulated in local newspapers. The wolf was killed and proved to be rabid by laboratory tests carried out at the Vaccine Institute in Amman.

In Amman governorate during the period 1977-1988 only two cases of human rabies were reported, one in 1981 and the other in 1988. In 1981 in the city of Amman, a story dog attacked several persons and domestic animals before being killed. Laboratory tests confirmed that the dog was rabid.

A six-year-old boy was bitten on the upper extremities by that rabid dog. His father sought medical assistance only after one month when the disease progressed with typical symptoms of rabies and the boy died 40 days after the bite.

In 1988 a four-year-old girl from the town of "Sahab" at 15 kilometers east of Amman, presented to the casualty department of Al-Basheer hospital. She complained of fever, sore throat and inability to walk and was diagnosed as meningitis and died a few days after admission. On questioning her family, they admitted that she might have been bitten by a fox and consequently her brain was sent to the Vaccine Institute to rule out rabies. Immunofluorescent tests confirmed that the girl was infected with the rabies virus.

Table IV. Reported rabies cases in humans during the period 1972-1988 in Jordan

Year	Number of cases	Year	Number of cases
1972	——	1981	1
1973	1	1982	3
1974	2	1983-1984	N.A
1975	3	1985	1 at least
1976	1	1986-1987	N.A
1977-1980	——	1988	1 at least

From these two rabies case-histories we should emphasize the following points:

1. In the two cases, medical assistance was not sought until very late when the opportunity to start rabies post-exposure prophylaxis was lost.

   Education of the public regarding the danger of animal bites, especially stray dogs and wild animals is very important and necessary.

2. Because human rabies is rare in Jordan, the diagnosis is especially difficult in the absence of an exposure history. Doctors should consider rabies in the differential diagnosis of any person with a rapidly progressive encephalitis or meningoencephalitis and they should question the patient's family very carefully to elicit any probable exposure to animal bite, scratch or contact.

Human Rabies Post-Exposure Prophylaxis

The department of public health in the "Amman Directorate of Health" is the only centre in Amman governorate where anti-rabies prophylaxis is carried out routinely. The vaccine in use is the Human Diploid Cell Vaccine "HDCV". A six dose vaccine regimen is followed "days 0, 3, 7, 14, 28 and 90". Day 0 refers to the day of initiation of vaccination.

Several factors must be considered in combination before deciding to give the HDCV, because it is quite expensive and should be used in a rational way. These factors are:

1 - The species of animal.

2 - The location of the animal.

3 - The circumstances of the incident.

4 - The type of exposure.

5 - The severity of the exposure.

6 - The rabies epidemiology in the region.

7 - The vaccination status of the animal.

In sever bites involving wild animals or dogs thought to be rabid, "Human Rabies Immunoglobulin" is given in addition to HDCV. In biting incidents involving healthy domestic dogs or cats, the animal should be confined and observed for 10 days and evaluated by a veterinarian at the first sign of illness. No treatment is given to the exposed person unless the animal develops rabies.

In 1988, 298 persons received anti-rabies post-exposure prophylaxis at the public health department in "Amman Directorate of Health".

The distribution by sex remained the same during the period 1981-1988. About 20% of persons who received anti-rabies post-exposure prophylaxis were females and 80% males.

The distribution by age of person who reported to the anti-rabies centre, showed that 25% of them are below ten years and about two thirds of them below twenty years of age.

There appears to be no important seasonal fluctuation in the number of persons reporting, other than a slight increase during the summer months. 40% of the persons report in the period June-September.

Table V. Human anti-rabies post-exposure prophylaxis at the public health department in Amman: Number of persons treated from 1981-1988

1981	1982	1983	1984	1985	1986	1987	1988
168	321	307	253	246	295	241	298

Table VI. Human anti-rabies post-exposure prophylaxis at the public health department in Amman: Distribution by sex of persons treated from 1981-1988

Year Sex	1981	1982	1984	1985	1986	1987	1988
Male	77%	83%	75%	82%	81%	81%	81%
Female	23%	17%	25%	18%	19%	19%	19%

Table VII. Human anti-rabies post-exposure prophylaxis at the public health department in Amman:
Distribution by age of persons treated from 1981-1988

Year Age-group	1981	1982	1984	1985	1986	1988
< 10 years	25%	32%	24%	25%	26%	23%
10-19 years	41%	42%	31%	39%	35%	30%
> 20 years	34%	26%	45%	36%	39%	47%

Table VIII. Human anti-rabies post-exposure prophylaxis at the public health department in Amman:
Distribution by place of exposure of persons treated during the period 1986-1988

Year Place of Exposure	1986	1987	1988
City of Amman	195 "66%"	139 "58%"	185 "62%"
Suburbs	100 "34%"	102 "42%"	113 "38%"

More than b0% of the incidents took place in the city of Amman, and if we take into consideration that many suburbs in Amman governorate are of urban nature, we can conclude safely that the majority of incidents took place in urban settings and most probably domestic animals are the major source of incidents giving rise to consultation and anti-rabies prophylaxis.

Animals of known owners are domestic and represent half of the animals responsible for the incidents.

Table IX. Distribution of animals responsible for the incidents leading to anti-rabies prophylaxis

Animal Year	Animals of Known Owner	Animals of Unknown Owner
1984	51%	49%
1985	51%	49%
1985	45%	55%
1988	43%	57%

Regarding animals of unknown owners, we can assume that many of them are domestic due to the following facts:

1. Many of the persons engaged in incidents with domestic animals would not say they known the owner because usually he is a friend or a neighbour and they don't like to get him in trouble with the police or with health authorities.
2. In many incidents the biting animal is domestic, but the victim simply does not know the owner.
3. As the majority of incidents take place in urban settings, it is assumed that domestic animals "mainly dogs" are responsible in the majority of cases. Nowadays few stray dogs are seen in urban areas of Amman, mainly due to activities of the "municipality of Greater Amman" - Destruction of stray dogs by poisoning and shotting.

As we can see from Table X, dogs represent the main source of exposure in biting incidents leading to rabies prophylaxis "78% - 96%", followed by cats "2% - 12%".

In one incident, a confirmed rabid wolf attacked a child in the residential area of "Abu-Nusair". This incident took place in January 1987. In another incident which took place in March 1986 in the rural area of "Ein-swema", a confirmed rabid hyaena attacked a 25 year-old farmer while working in the field.

Table X. Distribution of animals responsible for the incidents leading to anti-rabies prophylaxis in Amman governorate, 1981-1988

Year Animal	1981	1982	1984	1985	1986	1987	1988
Dog	154 "96%"	304 "95%"	215 "87%"	208 "86%"	238 "83%"	194 "78%"	244 "83%"
Cat	3 " 2%"	6 " 2%"	18 " 7%"	21 " 9%"	19 " 7%"	26 "11%"	37 "12%"
Rat	3	4	8	7	11	10	9
Donkey	-	1	4	4	1	-	1
Monkey	1	5	3	3	16	2	3
Fox	-	-	-	-	1	2	1
Wolf	-	-	-	-	-	1	-
Hyaena	-	-	-	-	1	-	-
Others	-	-	-	2	1	1	-

In both incidents, HDCV for rabies and Human Rabies Immunoglobulins were used and both victims survived.

Conclusions

1. Based on available data and official statistics, it seems that human rabies is rather rare in Jordan. But there is no guarantee this situation will continue.
2. So far no surveys were carried out to identify the different types of reservoirs for rabies virus in Jordan. Therefore, it is necessary to establish a country-wide rabies surveillance programme to clarify this point and to identify the transmitting animals.

3. HDCV is over-used in post-exposure prophylaxis due to various reasons. The decision to vaccinate is to be made after serious consideration of the risk of infection and should be based on a rapid and reliable assessment of the infective status of the biting animal.

References

1. Dr. Adnan Abdel-hameed, Jordan Vaccine Institute: Personal Communications.

2. Ministry of Health: Annual Statistical Report, 1977.

3. Amman Directorate of Health: Annual Statistical Reports, 1983-1988.

4. Professor Wachendorfer, Director of the Veterinary Investigation Center, Frankfurt, West Germany: Report on the evaluation of the rabies situation in Jordan, May 1981.

5. Kalus E. Wagner, DVM: The problem of rabies in Jordan, short term consultancy, May 1982.

STUDY ON HETEROLOGOUS IMMUNITY IN SCHISTOSOMIASIS USING HETEROPHYTE ANTIGENS

by

Magda Youseff, Laila M. Boulos and Mervat El-Azzouni

Parasitology Department: Faculty of Medicine,
Alexandria University, Alexandria, Egypt

Vaccination offers an attractive adjunct to existing health control measures. Unfortunately, the early optimism of workers in this field has in few instances been justified.

Recent work has concentrated largely on the use of heterologous antigen and vaccination studies indicate that antigens derived from an immature stage of Fasciola hepatica induce significant protective immunity to challenge schistosoma infection (Hanna, 1980). Using paragonisums westermani antigenic extracts, antibodies were induced in mice which reacted with S. mansoni adult worm antigen in mice which reacted with S. mansoni adult worm antigen thus suggesting the presence of protective antigens against S. mansoni in Paragonimus westermani (Hillyer and Serrano, 1983).

The present work was intended to study the possibility of production of immunity using another trematode as heterophids. The latter are common and easily obtainable trematodes in Egypt. Their effect on Schistosoma mansoni was studied both when mice were infected orally with its metacariae or inoculated with their antigens, either crude or partially purified, prepared from the adult stage.

Material and Methods

This work was carried out on 315 Swiss strain albino mice divided into 3 main groups.

Group A:
Composed of 90 mice, each primarily infected with 300 heterophyte metacercariae. These were further subdivided into six equal subgroups infected with 120± 5 S. mansoni cercariae at different time intervals, i.e., one, two, three, four, five and six months post-heterophyte infection (A_1, A_2, A_3, A_4, A_5, and A_6, respectively). For each subgroup a corresponding control group of 10 mice simultaneously infected with 120± 5 S. mansoni cercariae only (a) was used.

Group B:

This group comprised 45 mice which were divided into three subgroups according to the *antigenic dose. B1, B2 and B3* were given 100, 150 and 200 ug protein of crude antigen respectively. Each dose was divided into 2 equal parts and inoculated intraperitoneally with one week intervals. One week after the last dose, they were infected with S. mansoni cercariae. A control group was used, simultaneously infected with S. mansoni only.

Group C:

Thirty mice were divided into 3 subgroups C_1, C_2 and C_3. These were inoculated intraperitoneally with the three fractions derived from crude heterophyte antigens using the gel filtration chromatography (LKB Producer, Sweden, 1984). The dose was calculated according to the proportion of the elution volume of the crude antigen. Thus, a total dose of 71.5, 50 and 78.5 ug was given to the subgroups respectively in two equal, divided doses, with one week intervals. With each dose, 0.1 ml BCG was given. A week later, S. mansoni infection was superadded. Two controls were used, one given BCG followed by S. mansoni (30 mice), the other given S. mansoni only (30 mice).

Infection with heterophyte metacercariae after isolation from infected fish (Oshima et al., 19866) was done with a tuberculin syringe with a special blunt needle and oral administration to the experimental animals (Boulos, 1979), followed by S. mansoni infection using the paddling technique (Watson and Abdel-Azim, 1949).

To evaluate the degree of resistance in experimental animals, parasitological and immunological studies were done.

Parasitological studies included perfusion technique (Smithers and Terry, 1965) for recovery and counting of adult S. mansoni worms as well as liver and egg counters (Cheever, 1968).

Results

Group A:

Parasitological study:

Worm load:

There was a significant reduction in subgroups A_1, A_2, A_3, A_4 receiving S. mansoni 1, 2, 3, 4, months post heterophyte, especially subgroup A_1 (58.66%) and A_4 (53.4%), but there was no appreciable reduction in subgroup A_5 and A_6 (Fig. 1).

Tissue egg count:

The reduction in egg counters in both liver and intestine was directly proportional to the reduction in worm load.

Immunofluorescence:

In the control group fluorescence was seen around hepatocytes and cellular infiltration. There was granulomatous reaction around the egg at a titer of 1/10 (+++) to 1/60 (++), which gradually diminished to a titer of 1/640 (0) (Fig. 7). Group A_1 was examined

and found to be the same as the control except that the granuloma was smaller and fainter (++), down to a titer of 1/80 (+), and a disappearance at 1/160 (0).

Group B:

Parasitological study:

The highest dose of crude heterophyte antigens 200 ug protein given to subgroup B3 gave the highest percentage worm reduction (61.22%) and increased egg reduction/gm liver (63.77%) and intestine (66.48%).

In subgroup B_1 and B_2 the percentage reduction in worm load was 57.82% and 47% respectively.

Immunofluorescence:

Inhibition of fluorescence was seen in subgroup B_3 in the granulomata and perivascular cells, beginning at a titer of 1/20 (++) and stopping at a titer of 1/40 (0).

Group C:

By the gel filtration chromatography using ultrogel ACA_{44} three major fractions were demonstrated and designated C_1, C_2 and C_3, with molecular weights of 64.000, 60.000 and 40.000 daltons respectively.

Parasitological study:

The worm load and tissue egg count were markedly reduced in all subgroups but were most prominent in subgroup C_2 immunized by the second fraction where the percentage reduction in the worm load was 78.77% and the mean egg count/gm intestine and liver was 71.79% and 75.45%, respectively.

Immunofluorescent study (Gr. C_3):

At 8 weeks the hepatic and Kupffer cells were not fluorescing (0), and the granulomata showed very faint fluorescence at 1/10 (+) but was absent at a titer of 1/20.

Discussion

The increased emphasis on parasitic infections and the possibility of their control by immunological means has spurred new thinking about old problems. Thus, the immunological control measures are now accepted as recent approaches to many parasitic infections. This work studies the approach of utilizing heterophytes to induce protective immunity against S. mansoni in mice.

Primary infection with heterophyte metacercariae at different monthly intervals showed an appreciable reduction especially when given prior to S. mansoni infection by 1 and 4 months (58%, 53% respectively). This coincides with the level of heterophyte antibodies that reach their maximum at day 20 and 100 day post infection (Morishita et al., 1965). Previously it was shown that a significant level of worm reduction was reached when S. mansoni was given 1 month after a primary heterophyte infection (Youssef et al., 1983). The data obtained by tissue egg load indicates that although there was a significant reduction in the tissue egg counts, yet this reduction was directly proportional to the reduction in worm load which indicates that oviposition was not disturbed.

When crude heterophyte antigen was used in different doses as a second method of immunization, it was found that when a total of 200 ug protein was given the highest reduction was achieved in all parasitological parameters. However, when Paragonimus westermani whole worm extract was used in a dose of 750 ug no protection against S. mansoni was elicited but a lower dose did induce immunity (Hillyer and Serrano 1983). This could be explained by the fact that for every antigen and animal there is a range of antigen dose described as optimal (Bowry 1977). The schistosomal worm reduction could be due to the presence of an immune mechanism either present in the skin preventing cercarial penetration (McLaren et al., 1987) or in the serum due to increased serum TgA or IgE causing destruction of worms, and arrest of growth (Shoeb et al., 1976). Another cause for worm reduction could be the increased susceptibility of the newly transformed schistosomula to the killing mechanisms dependent on antibodies (Smithers & Doenhoff 1982). This suggests that the surface antigens of the early larval forms are necessarily the target of any humeral protective mechanism.

Inhibition of fluorescence was obvious around granulomata and perivascular wall at lower titers, possibly due to repeated antigenic injections (Magalheas et al., 1965). It is well known that crude antigens may possibly dissipate the host response, or results in competition of antigens (Abramoff 1960). Thus, in order to develop a more potent and highly effective vaccine against schistosomiasis, preparation of more refined antigens were tried.

By gel chromatography 3 distinct peaks could be eluted with different molecular weights: 64.000, 60.000, and 40.000 daltons, approximately. After calculating the dose of each fraction from the optimal crude dose, it was found that the least dose (50 ug protein) gave the highest reduction in all parasitological parameters. The observation that mice infected with either Fasciola hepatica Paragonimus westermani (Hillyer & Serrano 1983) or Heterophyte (present study) acquire resistance to challenge infection with the heterologous parasite S. mansoni suggests that this phenomenon could conceivably apply to other parasitic trematodes and that in addition to cross protection, it may result in modulation of the immunopathologic response. Such findings pave the way for further studies with future possibilities for better control of schistosomiasis. These results also suggest that a common functional antigen may be obtainable as a potential vaccine against trematodes in general.

References

1. Abramoff, O. Competition of antigens. The effect of a secondary response to one antigen on the primary response to a heterologous antigen administered at the same time. J Immunol 19860; 86: 648-55.

2. Andrews, P. The gel filtration behaviour of proteins related to their molecular weights over a wide range. Biochem J 1965; 96: 596-606.

3. Boulos, L.M. Parasitological studies on the heterophyte in tilapia fish from Edku and Maryiut lakes. Ph.D. Thesis Faculty of Medicine, Alexandria University. 1979.

4. Boulos, L.M., Abdou, L.A., Kelada, I.P., Youssef, M.M. The effect of a primary heterophyte infection on S. mansoni liver granuloma. Proc 4th Ann Sci. Cong Alex Fac Med 1983; 161-5.

5. Bowry, T.R. Immunological conference. Immunology Simplified Oxford, Chapter 8. 1977.

6. Cheever, A.W. A comparative study of S. mansoni infections in mice, gerbils, ultimammate rats and hamsters. The relation of portal hypertension to size of hepatic granuloma. Am J Trop Med Hyg 1965; 14: 211-26.

7. Cheever, A.W. Conditions affecting the accuracy of potassium hydroxide digestion techniques for counting S. mansoni eggs in tissue. Bull WHO 1968; 39: 328-31.

8. Hang, L.M., Warren, K.S., Boros, D.L. Schistosoma mansoni antigenic secretions and the etiology of egg granuloma in mice. Exp Parasitol 1974; 35: 288-98.

9. Hanna, R.E.B. Fasciola hepatica. An immunofluorescent study of antigenic changes in the tegument during development in the rat and sheep. Exp Parasitol 1980; 50: 155-70.

10. Hillyer, G.V. Immunity to schistosomes using heterologous trematode antigens. A Review Vet. Parasitol. 1984; 14: 263-83.

11. Hillyer, G.V., Serrano, A.E. Cross protection in infections due to S. mansoni using tegument antigens of Fasciola hepatica. J. Infect Dis 1982; 145: 728-32.

12. Hillyer, G.V., Serrano, A.C. The antigens of paragonimus westermani. Schistosoma mansoni and Fasciola hepatica adult worms. Evidence for the presence of cross reactive antigens and for cross protection to Schistosoma mansoni infection using antigens of Paragonimus westermani. Am J Trop Med Hyg 1983; 32: 350-8.

13. Hsu, S.Y.L., Hsu, H.F., Mitros, F.A., Helms, C.M., Solomon, R.I. Eosinophils as effective in the destruction of Schistosoma mansoni eggs in granulomas. Ann Trop Med Parasitol 1980; 74: 180-3.

14. James, S.C., De Blois, L.A. Induction of protective immunity against Schistosoma mansoni by a non living vaccine II. Response to mouse strains with selective immune effects. J Immunol 1986; 136: 3864-71.

15. James, S.C. and Sher, A. Prospects for a non living vaccine against schistosomiasis. Parasitology Today 1986; 2: 134-7.

16. LKB Produkter-Sweden. Ultrogel and trisacryl A practical guide for use in gel filtration 1984; 26.

17. Magalheas Filho A., Krupp, I.M., Malek, E.M. Localization of antigen and presence of antibody in tissues of mice infected with Schistosoma mansoni as indicated by fluorescent antibody technique. Am J Trop Med Hyg 1965; 14: 84-99.

18. Mansour, N.S., Youssef, F.G., Mikhail, E.M., Boctor, E.N. Use of partially purified Fasciola gigantic worm antigens in the serological diagnosis of human fascioliasis in Egypt. Am J Trop Med Hyg 1983; 32: 550-4.

19. McLaren, D.T., Strath, M., Smithers, S.R. Schistosoma mansoni: Evidence that immunity in vaccinated and chronically infected CBA, Ca mice is sensitive to treatment with a monoclonal antibody that depletes cutaneous effector cells. Parasite Immunology 1987; 9: 667-82.

20. Michael, A.I., Awadalla, H.N., Farag, H.F. Granuloma size in the liver of mice with S. haematobium infection and S. mansoni challenge. Tropen Med Parasitol 1979; 30: 62-4.

21. Morishita, K., Komiya, Y., Matsubayashi, A. Progress of Medical Parasitology in Japan Vol Meguro Parasitological Museum. Tokyo 1965; 2: 366-72.

22. Oshima, T., Niagei, N., Kihata, H. A simple method for estimating the total number of metacercariae of Metagonimus Yokogowai in Plecoglossus altivalis. A new proposal of the infection index of fish Jpn J Parasitol 1966; 15: 161-7.

23. Shoeb, S.M., Basmy, K., Madwar, M., Massoud, A., El-Halawany, M.F. Studies on the possibility of production of immunity against schistosomiasis in experimental animals Egypt J Bilh 1976; 3: 169-82.

24. Smithers, S.R., Doenhoff, M.F. "Schistosomiasis" in Cohen, S., Warren, K., ed. Immunology of parasitic diseases. Blackwell Scientific, Oxford 1982; 527-607.

25. Smithers, J.R., Terry, R.J. The infection of laboratory hosts with cercariae of Schisotoma mansoni and the recovery of adult worm. Parasitology 1965; 55: 695-700.

26. Taylor, M.G. and Bickle, A.D. Towards a schistosomiasis vaccine Parasitology Today 1986; 2: 132-4.

27. Vignali, D.A.A., Bickle, Q.D. and Taylor, M.G. Studies on immunity to Schistosoma mansoni in vivo: Whole body irradiation has no effect on vaccine induced resistance in mice. Parasitology 1988; 96: 46-61.

28. Warren, K.S. and Berry, E.G. Induction of hepatosplenic disease by single pairs of the Philippine, Formosan, Japanese and Chinese strains of Schistosoma japonicum. J Infect Dis 1972; 126: 483-91.

29. Watson, J.M. and Abdel-Azim, M. Comparative efficiency of various methods of infecting mice with Schistosoma mansoni Ann Trop Med Parasitol 1949; 43: 41.

30. Weinstock, J.V., Blum, A.M. Modulation of granulomatous inflammation in murine schistosomiasis mansoni by enteric exposure to Schistosoma Ova: In vitro characterization of a regulatory mechanism within the granuloma. Cellular Immunology 1987; 108: 252-59.

31. Wilson, M., Sulzer, A.J., Walls, K.W. Modified antigens in the indirect immunofluorescence test for schistosomiasis. Am J Trop Med Hyg 1974; 23: 1072-6.

32. Yamaguti, S. Symposis of digenetic trematodes of vertebrates, Vol I & II Keigaku Publishing Co., Tokyo, Japan. 1971.

33. Youssef, M., Awadalla, H.N., El-Azzouny, M., Boulos, L.M. A trial to induce acquired protection against Schistosoma mansoni by experimental heterophyte infection. J Egypt Soc Parasitol 1983; 13: 239-46.

RESETTLEMENT, SCHISTOSOMIASIS AND RESEARCH ON CONTROL EFFORTS IN ALEXANDRIA, EGYPT

by

Hoda F. Farag

Medical Research Institute, Alexandria University

Introduction

Wide projects of land reclamation are undertaken in desert regions western to the Nile Delta, near Alexandria, Egypt. A new society became permanently established in villages in these localities and they represent socio-economic units whose main activity is agriculture.

Mariout area is one of those projects. It extends along the Alex-Cairo desert road and starts at 32 kms. west of Alexandria. Its main water supply is a branch from El-Nubarieh canal, and water passes to drains that end in Lake Mariout. Twenty-six villages are present in Mariout area. The population in this project has been settled since 1967 and according to the census performed year 1979 by the International Center for Agriculture development, 16,365 individuals inhabited the area.

The goal of this study is the evaluation of Damsissa (Ambrosia-martima) in the control of bilharziasis in these reclaimed lands. As no base line data concerning the problem of schistosomiasis were available, the efforts during the first year (1988-1989) were devoted to establishment of these data.

Material and Methods

1. Choice of the villages:

Seven of the 26 villages in Mariout area were first chosen for this study.

2. Demographic study:

The houses were numbered and maps prepared for the seven villages. Then a census of the inhabitants in every village was performed and data collected concerning age, sex, occupation, etc.

3. Collection and examination of urine and stools:

Field visits were carried regularly every week. Containers for urine and stool specimens were labelled and distributed to all houses. The inhabitants were given the necessary instructions for delivery of proper samples. Next day the specimens were collected and returned to the laboratory. On the average, 200 urine and 200 stool specimens were collected weekly. They were kept in refrigerator and examined during the rest of the week. Urine specimens were examined after nucleopore filtration of 10 ml. urine and stool specimens after the modified Kato Katz method.

4. Study of the irrigation layout in the selected villages:

Maps of all water channels present in the lands owned or served by the population in the domain of each village were prepared, canals and drains were given numbers and measured.

5. Snail survey:

A systematic snail survey of all water courses in the chosen villages were performed after preparation of maps. Snails were collected following the standard techniques described by El Sawi et al. (1983), using a dip net with 2 dips taken 1 m. apart at each of 12 sampling stations equidistant along the water course length. Any snail collected was kept in a labelled nylon bag.

Snails were then transferred to the laboratory, counted, measured and examined for trematode infection. They were exposed to light every other day for two weeks; snails shedding cercariae were isolated. All other snails were then crushed and examined for larval stages of trematodes. This snail study was undertaken during June and July i.e. during the months of maximal snail density and infection.

Results

The population of Mariout area were immigrants from all provinces in Upper and Lower Egypt. Table 1 presents the number of houses and the population size in the chosen villages. However after studying the census data, it was observed that the majority of the population of the small villages were not farmers working in the land but workers, employees, etc.

Moreover, results of the survey in the village of Abou Bakr revealed a prevalence of S. mansoni of 3.2%. Accordingly the studies were limited to the three villages of Orabi, El Gazayer and Palestine whose total population amounted to 6,458 individuals (Map 1).

The houses in Mariout area were built by the Mariout Company, in a regular manner. Each house is provided with a latrine and supplied with pure potable water. Rural Health Units are present in El-Gazayer and Palestine villages.

Table 1. Number of houses and population size of the chosen villages

Village	Number of houses	Population size
Orabi	190	1241
El Gazayer	248	1813
Palestine	459	3404
El Yemen	99	621
El Iraq	79	498
Mostapha Kamel	76	488
Abou Bakr	79	212

The irrigation system is similar to that in the Delta; however, water is relatively scarce. Irrigation takes place in turns every ten days; in between rounds the water channels become completely dry. This is because the soil is sandy and the canals are not cement lined. Only relatively large canals and drains were found to contain water permanently.

As to agricultural activities, all basic staple crops are planted in the land with the exception of cotton and of rice. Moreover all sorts of vegetables and fruits are cultivated over wide areas.

Prevalence of bilharziasis in the three villages:

The bilharziasis survey was started in December 1988 and was terminated in June 1989. The compliance rate in the three villages was 65% in Orabi, 56% in El-Gazayer and 58% in Palestine. A total of 3,903 individuals were studied.

Table 2 presents the overall prevalence of bilharziasis in the three villages. It is observed that 20% of the population of Orabi; 40% of El-Gazayer and 27% of Palestine had S. mansoni infection. As to S. haematobium, by examining a sample of 600 urines from each village, only one or two individuals were found infected.

Table 2. Prevalence of S. mansoni in the three villages (1988 and 1989)

	Orabi	El Gazayer	Palestine
Number of individuals examined	788	1019	2094
Number positive	173	408	577
Proportion positive	21.95	40.04	27.55

Prevalence of S.mansoni by age and sex:
In Orabi, the infection rate among males was 21%, among females it was 19%. The highest prevalence (39%) was observed in the age group 10-15 years, in males; in females, the highest infection (33%) was in the age group 15-20 years. Generally all ages were infected even children less than 5 years of age. (Table 3).

In El Gazayer, the difference in infection between sexes was more pronounced, prevalence being 49% in males and 31% in females. A wide peak prevalence that attained 70% in males, covered the age groups 15-40 years. Among females, the highest prevalence was 49% in the age group 20-30 years. Children less than 5 years were infected and infection was maintained in the older age groups. (Table 4).

In Palestine, the infection rate in males was 30% and in females 25%. Peak prevalence of 48% and 39% in males and females were found in the ages 15-30 years and 15-20 years respectively.

Results are presented in Table 5.

Intensity of infection in the three villages:
Table 6 presents the geometric mean egg counts in the three villages.

The geometric mean was calculated for all individuals examined i.e. taking in consideration positives and negatives. It is observed that the intensity of infection was parallel to the prevalence in the three villages.

Table 3. Prevalence of S. mansoni by age and sex
Orabi, 1988

Age group	Male	Female	Total
< 5	7.50	12.50	10.00
5-	20.00	15.00	17.78
10-	39.29	13.21	26.61
15-	35.90	33.33	34.62
20-	30.77	25.71	28.87
30-	32.43	25.81	29.41
40-	16.67	20.69	18.87
50 & over	22.22	18.52	20.63
All ages	24.31	19.50	21.95

Table 4. Prevalence of S. mansoni by age and sex
El Gazayer (1988, 1989)

Age group	Male	Female	Total
< 5	17.07	10.61	14.19
5-	33.70	18.29	26.44
10-	54.02	37.14	46.50
15-	69.64	35.59	52.17
20-	67.39	49.40	55.74
30-	70.69	42.19	55.74
40-	52.94	22.86	37.86
50 & over	53.57	24.49	40.00
All ages	49.12	30.91	40.04

Table 5. Prevalence of S. mansoni by age and sex Palestine, 1989

Age group	Male	Female	Total
< 5	9.40	12.70	10.90
5-	22.78	17.08	19.92
10-	39.19	28.57	34.03
15-	48.65	39.65	43.15
20-	46.37	34.01	37.96
30-	42.31	26.19	31.37
40-	33.78	32.94	33.33
50 & over	41.57	27.50	34.46
All ages	30.28	25.20	27.55

Table 6. Prevalence of S. mansoni and Geometric mean egg counts in the three villages (1988 & 1989)

Village	Prevalence	Geometric Mean
Orabi	21.95	2.60
El Gazayer	40.04	6.33
Palestine	27.55	3.41

Intensity of infection by age and sex:

Considering the geometric mean for all individuals, it is obvious that the intensity of infection is higher among males and runs in both sexes parallel to the prevalence in the different age groups.

Results of the three villages are presented in Tables 7, 8 and 9.

Prevalence of bilharziasis by occupation:

Prevalence of bilharziasis was highest among farmers. Among workers and employees who represented a minority of the population the level of infection was still high.

Results are presented in Tables 10, 11 and 12.

Water channels:

Table 13 demonstrates the number and length of the canals and drains in the three villages. The proportion of channels containing water is also presented.

It is observed that 7, 7.5 and 4.5 kms, representing 20%, 45% and 28% of the water networks in Orabi, El Gazayer and Palestine contained water. All the rest of canals and drains were found dry.

Table 7. Geometric mean egg counts by age and sex
Orabi, 1988

Age group	Male	Female	Total
< 5	1.33	1.69	1.50
5-	2.52	1.86	2.20
10-	6.06	1.74	3.30
15-	5.05	4.25	4.63
20-	3.94	3.13	3.45
30-	4.03	3.12	3.59
40-	1.96	2.49	2.24
50 & over	2.56	2.16	2.38
All ages	2.91	2.32	2.60

Table 8. Geometric mean egg counts by age and sex
El Gazayer (1988, 1989)

Age group	Male	Female	Total
< 5	2.05	1.54	1.81
5-	4.63	2.39	3.39
10-	15.58	5.02	9.39
15-	29.74	4.52	11.31
20-	23.50	8.65	12.12
30-	29.33	6.63	13.16
40-	11.62	2.91	5.77
50 & over	12.76	2.94	6.16
All ages	10.31	3.88	6.33

Table 9. Geometric mean egg counts by age and sex
Palestine, 1989

Age group	Male	Female	Total
< 5	1.50	1.66	1.58
5-	2.64	2.08	2.34
10-	5.76	3.89	4.76
15-	9.65	6.21	7.37
20-	8.55	4.32	5.38
30-	6.81	2.90	4.02
40-	4.75	4.27	4.49
50 & over	6.76	3.22	4.67
All ages	3.90	3.03	3.41

Table 10. Prevalence of bilharziasis by occupation
Orabi, 1988

Occupation	Number examined	Number positive	Percent positive
Farmer	96	28	29.17
Worker & employee	75	24	32.00
Others	599	177	19.59

Table 11. Prevalence of bilharziasis by occupation
El Gazayer (1988, 1989)

Occupation	Number examined	Number positive	Percent positive
Farmer	293	174	59.99
Worker & employee	45	24	53.33
Others	681	210	30.84

Table 12. Prevalence of bilharxiasis by occupation
Palestine, 1989

Occupation	Number examined	Number positive	Percent positive
Farmer	417	186	44.60
Worker & employee	126	44	34.92
Others	1535	342	22.28

Table 13. Number and lengths of water channels in the three villages

	Orabi	El Gazayer	Palestine
Number of canals	67	21	14
Number of drains	35	36	64
Total number of channels	102	67	78
Length of canals (km.)	23.750	7.460	4.910
Length of drains (km.)	12.210	9.100	10.310
Total length of channels (km.)	35.960	16.560	15.220
Length of dry channels (km.)	28.960	9.060	10.860
Length of channels containing water (km.)	7.00	7.510	4.360
Proportion of channels with water (%)	19.47%	45.35%	28.65%

Snail survey:
No Bulinus truncatus were found in the locality.

Table 14 presents the results of the snail survey in the three villages. Snail numbers represent the summation of collections of two months, June and July.

In Orabi, only one drain 1.5 km. long, representing 4% of the water channels in the village was found harbouring snails. Examination of these snails even after crushing, did not reveal any schistosomal infection. (Map 2).

In El-Gazayer, 4 drains and 4 canals, harboured snails. By examination out of 319 snails collected, 38 were found infected giving an infection rate of 11%. 192 snails were collected from one drain, of which 36 were found infected giving an infection rate

Table 14. Snail survey in the three villages June and July 1989

	Orabi	El Gazayer	Palestine
Snails			
Total number of snails collected	160	319	65
Total number of infected snails	0	38	5
Proportion of infected snails (0)	0	11.2	7.6
Infested channels			
Number of canals with B. alex	0	4	0
Number of drains with B. alex	1	4	1
Length of infested canals (km.)	0	3.38	0
Length of infested drains (km.)	1.5	1.72	0.5
Total length of infested channels (km.)	1.5	5.10	0.5
Proportion of infested channels to water network (%)	4.17	30.8	3.29
Infected channels			
Number of canals with infected snails	0	1	0
Number of drains with infected snails	0	1	1
Length of infected canals (km.)	0	0.350	0
Length of infected drains (km.)	0	0.700	0.500
Proportion of infected channels to water network (%)	0	6.34	3.29

of 18.75%; 31 snails were collected from one irrigation canal and revealed an infection rate of 6.45%. The rest of the snails were free of infection.

In this village the infective channels amounted to 6.3% of all water channels. (Map 3).

In Palestine, only one drain 500 meters long harboured snails which revealed an infection rate of 7.6%. This drain represented 3.2% of the water network in this village. (Map 4).

Discussion

Orabi, El Gazayer and Palestine, represent resettlement populations whose main occupation is agriculture. They have reclaimed their lands over desert. In the reclamation projects western of Alexandria, several factors were supposed to suppress

transmission and prevent establishment or extension of bilharziasis. These factors are related to the snail environment as well as to the sanitary status in the villages.

Essentially, the lands in Mariout area are sandy and the amount of water is not abundant; accordingly, the majority of the water channels were found completely dry in between the irrigation rounds, particularly during the hot summer. Biomphalaria alexandrina snails could not survive in these channels; however, they found all the suitable conditions for their development in the few canals and drains which contains water permanently and in which growing vegetation offered shelter and food.

Regarding the community, sanitary measures were made available to the population in the form of a latrine and potable water in every house. These measures were expected first to diminish the contamination factor, second to decrease water contact by allowing several of the water related activities to be performed indoors.

In spite of all these factors, the present study revealed that bilharziasis has become established all over the laclity. However, the highest prevalence and intensity of infection observed in El Gazayer village, were significantly lower than values reported from nearly villages in the Nile Delta (Barakat pers. communication). Prevalence rates reaching 100% in children and geometric mean egg counts of 200 eggs/gm stools were reported.

In the reclamation area, human activities and sanitary level were similar but snail distribution and infection varied in the three villages. A relationship was found between the presence and infection of the snail intermediate host and human infection rates. For instance, in Orabi, where no infected snails were detected, the prevalence of schistosomiasis was the lowest. Bilharziasis was probably acquired partly locally from a minimal number of infected snails present or even through cercariae entering the area with the waters of irrigation. Another source of infection might be through the movement of the population to nearby areas as well as to their home provinces. (This may explain the very few cases of S.haematobium diagnosed, taking in consideration the changing pattern of schistosomiasis and the decreasing prevalence of haematobiasis in the Nile Delta).

In Palestine and El Gazayer, the infection in the human host was influenced by the number of snails and the presence of foci of infection. The infection rate in these foci was extremely high compared to the values reported from various areas in the Nile Delta (maximum values reported in summer in these areas did not exceed 5%).

In building the strategy of control of bilharziasis in the reclaimed lands, the foci with high infection potential should receive first priority. They are highly dangerous sites; fortunately, they are limited and can be easily controlled. This may lead to lowering the magnitude of transmission. Combat of snails all over the water network in a limited locality is expected to ensure a similar reduction in transmission. Treatment of infected individuals in such cases may lower the prevalence and intensity of infection among the population so that the break point is attained.

Damsissa, (Ambrosia maritima) is a plant possessing a high degree of molluscicidal activity. Studies begun in 1961 by Sherif and El Sawi, have revealed that this herb possesses a lethal action to all stages of the snails and parasites. Recently, El Sawi et al. in their studies undertaken since 1980 and till now, have proved through controlled field studies, the efficiency and applicability of this plant in killing the snails. They recommended its use in control of bilharziasis and stressed its advantage over the chemical molluscicides which lead to environmental pollution. Studies presently undertaken in a highly endemic locality in the Nile Delta have revealed significant lowering of transmission. The results were confirmed by mice exposure experiments.

In the reclaimed lands, in which the snail intermediate host is finding difficulties in survival, the effect of Damsissa is expected to be very pronounced. (The schedule) for the future work (in the two coming years), will be as follows: 1. Treatment of infected individuals using praziquantel will be undertaken during the next few months. 2. Early in April or May, as recommended by El Sawi et al., Damsissa will be applied wherever snails are or may be present. Summer transmission is expected thus to be interrupted and evaluation of control efforts will then begin.

COMMUNITY CONTROL OF SCHISTOSOMIASIS IN ZIMBABWE

S.K. Chandiwana, P. Taylor*, D. Matanhire, G. Mbaya, S. Makoni

Blair Research Laboratory, Causeway, Harare, Zimbabwe

Key words: Human schistosomiasis, community-based control, Zimbabwe.

Introduction

Schistosomiasis is a major parasitic disease in Zimbabwe ranking second after malaria in its public health importance. Recent nationwide surveys for schistosomiasis showed that over 50 per cent of the population living in high endemic zones were infected by the urinary form of the disease (*Schistosoma haematobium*).[1] On the other hand, prevalence of the intestinal form (*S. mansoni*) is usually under 20 per cent.[1]

In the past, lack of a clear understanding of the major factors that influence the epidemiology of schistosomiasis prevented the development of control strategies that were appropriate to each endemic situation and could be implemented on a wide scale and on a sustainable basis. Recent comprehensive and longitudinal studies conducted by the Blair Research Laboratory have provided detailed information on focality and seasonality of schistosomiasis transmission, on human water contact patterns and on prevalence, intensity, morbidity and incidence of infection in the human population.[2-5]

---

* Present Address: Training Centre for Water and Sanitation, Department of Civil Engineering, University of Zimbabwe.

Based on the results obtained from the above studies, a community-based primary health care (PHC) approach to control morbidity and transmission in a rural community of over 30 000 people is outlined and discussed. The community-based PHC approach to schistosomiasis control is the strategy adopted in Zimbabwe.[6]

The PHC approach allows for the active participation of the population. This is essential for long term and sustainable control programs. The community can be actively involved in control activities such as assisting local health authorities in the distribution of antischistosomal drugs and health education posters, snail control through habitat modification and use of plant molluscicides, and sharing costs of the sanitation and water supply programs. Such community-based participatory and cost-sharing activities lower costs of the control program to the health services and funds may be saved for tackling other health problems. In addition, local leaders can develop a community level surveillance system to monitor the progress of interventions and to determine an appropriate mechanism for sustaining the achievements.

Project Area and Control Design

Madziwa communal area comprising 53 villages (total area is about 21 000 hectares), with a total population of 30 913, was selected for the demonstration control project. The communal area lies in the north-east high veld of Zimbabwe, a region of high rainfall and temperature in summer, numerous perennial streams, ad high densities of human population, conditions which favour a high transmission of schistosomiasis. At the beginning of the control project combined prevalence of both forms of diseases as in excess of 60% in the majority of villages. A significant proportion of children and young adults (7 - 20 years) harboured heavy infections (i.e. > 50 S. haematobium eggs per 10 ml of urine or > 100 S. mansoni eggs per gram of faeces).

The human population is made up of the MaShona ethnic group of peasant farmers who intensively rear cattle as a form of wealth and for use in customary activities. Before the sanitation and water supply programs were begun the majority of the people used natural water (streams) for all water-related activities, piped/borehole water sources being few or unavailable. Most people used the cover of bushes and crops for excretion because toilet facilities were inadequate.

The Madziwa project (initially for three years: 1985 - 1988) investigated the effectiveness of integrated control measures against schistosomiasis at the community level. The design involved control of schistosome infections through selective treatment targeted at school children, those being among the most heavily infected groups in the community. It was considered that progress made through selective chemotherapy would be consolidated by improved sanitation, provision of safe water supplies and health education.

Targets were set at one latrine per household, one protected water point for every 25 to 30 families, and intensive health education through annual school-based drama competitions, talks, films, posters and local committees. A single blanket application of the commercial molluscicide Bayluscide was applied into the main streams at the beginning of the program in order to support the impact of the initial chemotherapy.

To evaluate the impact of the improved sanitation, protected water supplies and health education campaigns, 16 villages in Bushu rural community were subject to selective targeted treatment of the school children only. In these villages there were no active programs to improve sanitation, water supplies, or health education, or to control snail hosts. Bushu is located about 20 kilometres from Madziwa area, and presumably the mixing of human populations of the two communities through inter-migration is not a problem. However, topographical, cultural and socioeconomic conditions, and prevalence rates of schistosomiasis in the two areas, are essentially the same.

Control Measures

Chemotherapy

Treatment was targeted primarily at school children aged 7 to 15 years of age, but older pupils and some teachers (up to the age of 21 years) were also included. Peak intensities of schistosome infections are known to occur in these age groups.[2] Targeted treatment was facilitated by the fact that in the project localities, as in most rural areas of Zimbabwe, about 90% of the children attend school. Class teachers were available to assist with records and in controlling the pupils. In the Madziwa and Bushu project areas school children comprised about 50 per cent of the total populations.

Children were examined for haematuria using reagent strips and those positive were given oral dosages of praziquantel at the recommended regimen of 40 mg/kg body mass.[7] The sensitivity and specificity of reagent strips to haematuria were found acceptable following evaluation by parasitological examination of urine and stool specimens from 20% of children participating in the study. The technique saves a considerable amount of time when compared with conventional methods and is a convenient, rapid and effective tool for screening infected children. Treatments were done during January - February 1986, September - October 1986, and September - October 1987.

Results of our initial analysis of the impact of treatment on S. haematobium infections showed a marked reduction in the targeted age class, particularly for heavy infections (Fig 1). However, treatment targeted at school children may not have a substantial impact on transmission and some reinfections observed could be attributed to infected members of other age groups who did not receive treatment (Fig. 1). Whether in the long term treatment targeted at school children has some benefit to other age groups remains to be seen in the ongoing monitoring program. Similarly, comparison of incidence rates data from the Madziwa and Bushu project localities should elucidate the role, if any, of improved sanitation, safe water supplies, health education and snail control in slowing the force-of-infection of endemic schistosomiasis.

Sanitation

The ventilated improved pit (VIP) latrine locally known as the Blair latrine (Fig. 2) is the sanitation technology of choice in Zimbabwe. It was developed in the early 1970s and its acceptability and effectiveness is probably measured by the fact that over 120 000 VIP latrines have been constructed throughout the country in the last 10 years. The VIP is an improvement over the pit latrine and when it is properly constructed it is odourless and free of flies. The latrine works without water and is thus appropriate for most rural communities where water is a problem.

To encourage latrine construction in the Madziwa project area, the research team, through the local health assistants and committees, provided 5 bags of cement, a stainless steel mesh for the fly-screen, and reinforcing wire to each family willing to construct a VIP latrine. These subsidies per family add up to about US $28 per latrine. The family provides labour for digging the pit, sand and gravel, bricks and labour for the construction of the latrine. Locally recruited persons were trained to build the VIP latrines, thereby introducing building skills into the community. Approximately US $27 were required to contract a locally trained individual to build a single compartment latrine. There were additional costs for materials and labour if a family required a two-compartment latrine. This type of latrine is convenient and proved to be very popular in the project area.

Members of the research team, with support from the provincial health authorities, regularly visited the project area and gave advice to the locally trained builders as well as monitoring the quality of latrines built. The target of 3000 latrines of the Madziwa area was not met. However, this was somewhat compensated for by the fact that, of 2152 latrines that were completed by November 1988, nearly half were of the double compartment type. Furthermore, the monthly cumulative numbers of latrines and pits dug since the project was started (Fig. 3) suggest that satisfactory progress was made. Of significance is the fact that the majority of the latrines met the standard specifications, indicating that the training program for the builders was effective. It still remains to maintain the momentum if the goal of one latrine per family is to be achieved.

In a project of this complexity extending over an area of about 21 000 hectares there are variations in local conditions and in the requirements for promoting the sanitation program. In addition, personal enthusiasm of local leaders, local customs, and the degree of cooperation from the peasant families had a significant influence on the rate of construction and thus on the total number of latrines that were built in each ward. The Blair latrines were accepted by the communities, particularly the double compartment version for males and females. Strict separation in usage of ablution facilities by sex accords well with the cultural norms of the MaShona.

Water Supply

The National Action Committee for the International Drinking Water Supply and Sanitation Decade in Zimbabwe has approved low cost technologies for the supply of water to scattered village communities. For the water supply component of the Madziwa schistosomiasis control project three approaches were adopted: 1) the use of a hand operated drilling rig to increase the number of wells; 2) installation of simple pumps (Blair and bucket pumps) on shallow wells; and 3) construction of washing slabs at water points.

As with the sanitation program, efforts were made to involve the community in all aspects of the water program. Inputs of the local people included provision of their labour for drilling or digging wells, provision of bricks and river sand for the wells and washing slabs, and preparation of rings for well lining. The villagers played a central role in the identification of sites for drilling new wells or upgrading existing wells. The research team, with the help of other government agencies such as the District Development Fund (DDF), assisted in the formation and training of water committee members to install, maintain and repair water pumps.

Before the beginning of the water program, there were 40 boreholes fitted with hand operated bush pumps in Madziwa. The Bush pump is more robust than the Blair pump and is suitable for heavy-duty settings, such as those required at schools and business centres. The target was to install 150 hand pumps (approximately three pumps per village). This target was by and large met if we take into account the Bush pumps, 104 shallow wells that were fitted with Blair hand pumps, and several protected wells that were fitted with bucket pumps.

Some factors militated against optimum usage of the available water points. In some cases water points were not easily accessible because of distance (localities near the villages were often rocky) or because some individuals claimed sole rights to wells that had been protected but were located on their land. In others, wells dried up during the dry season because they were not deep enough. However, the most important factor for the water program concerned operations and maintenance of the water works. A clear national policy on who is responsible for maintenance and repair of installed pumps is required, because observations in the project area showed that communities do not recognize installed pumps as belonging to the community and therefore as being their responsibility.

Health Education

In spite of the high prevalence of schistosomiasis in the project area, a survey of knowledge, attitude and practices (KAP) conducted before the beginning of the control program revealed that knowledge about the disease, its public health importance, transmission and control were not well understood. Few people associated schistosome infections with absence of latrines and unprotected water supplies. Although the people probably observed snail hosts in the natural streams they visited, in most cases they were unaware that snails played an essential role in the transmission process.

People usually acquired infection during a variety of water contact activities such as bathing, swimming, washing clothes and utensils and crossing bodies of water. However, as the effects of schistosomiasis infection are not as dramatic as those of malaria, the people were generally not aware of the infection. Under such circumstances, it was necessary to launch a vigorous health education campaign to alert the people of the dangers of infection and also of the need to control the disease.

The implementation of the health education program proved to be fairly complex. It was found convenient that health education be primarily undertaken by health officials in the district, with some technical support from the research team. Three main approaches were selected to provide health education to the communities:

1) posters, films and talks
2) drama competitions
3) local committees.

Posters and films on schistosomiasis, hygiene and safe water were available and were distributed throughout the project area with emphasis on schools and women's groups. Posters and films on the construction of Blair latrines and upgrading of wells were popular because they were clear, portrayed indigenous actors and were relevant to the perceived health needs of the people. As well, in rural communities, films (even educational ones) provide rare entertainment and therefore are well attended. After the films, health assistants and nurses talked to the people present on various aspects of hygiene and other health matters to support and strengthen community participation in the various control activities.

Drama is an important part of local culture and we incorporated it in the health education program as an effective means of communication. For organizational reasons the annual drama program was focused on schools. It was hoped that drama would be a more effective means of reaching the adult population, which is less easily accessible. The themes of the plays sought to facilitate understanding of the disease and its control.

To encourage broad identification with the project, private sector companies were encouraged to give donations for the prizes (e.g., stationery, food, cash, etc.). District officials from the ministries of health, education and local government were invited to judge the plays and also present opening and closing speeches. Drama competitions were popular with people of different ages who came to watch the performances. Members of the research team and health officials took the occasion to discuss with the people various aspects of the control project.

For a community-based control program, the involvement of the target communities in disseminating health education is essential. Efforts were therefore made to maintain an information exchange system between local health officials, members of the village and ward development committees, and local political and civic leaders. These groups and individuals played an important role in mobilizing the people to take part in various aspects of the control project, particularly the sanitation and water supply components.

In spite of the efforts described above, health education proved to be a difficult aspect of the control program. Local health staff did not spend enough time in addressing the people because of other pressing duties. In addition, organizational and transport problems limited the number of school visits that could be made by the health education officers. Such a situation probably explains the results of the KAP surveys of 1985 and 1988 (pre- and post-intervention, respectively) which indicated that health education had a very limited impact on knowledge of schistosomiasis by female heads of household.

In addition, knowledge of specific aspects of the life cycle of the disease by children was poor. This could be attributed to the fact that health education attempted to get children to grasp too technical details of the disease. Health education should aim at developing the ability of children to apply the information acquired to disease prevention. Interestingly, the majority of them were aware that natural streams were a source of infection. Such knowledge should be used to reinforce health education messages.

Snail Control

In support of the other control activities, Bayluscide, a synthetic molluscicide was applied to all permanent water bodies in July 1986. A total of 123.6 kg of 70% wettable powder of the molluscicide was used, packets of 50 g being mixed in 8 litres of water and used as a cover spray. Spraying was carried out 10 metres upstream and 5 metres downstream from the contact site, spraying from one bank to the other.[8]

Commercial molluscicides are too expensive for routine use and in the control project Bayluscide was used once at the beginning of the control program. Only human water contact sites were treated. In the long term sustained snail control would realistically be through the use of a low cost and locally obtainable molluscicide. Great promise has been shown by berries of the African soapbery, Phytolacca dodecandra, which are highly toxic to snail hosts.[9]

Evaluation

The effectiveness of the community-based schistosomiasis control project is being assessed by annual age-prevalence surveys in the human population and monitoring infection rates in snail hosts. Selective chemotherapy of school children based on reagent strip detection of haematuria proved to be an effective and cost-effective means of detecting and treating S. haematobium infections. Nevertheless, the rate of reinfections appeared to be rather high although infection intensities were generally low. Infection rates may be misleading in evaluating the effectiveness of interventions since intensity and length of exposure to infection are the major determinants of the development of morbidity.

The impact of the sanitation, water supplies and health education programs will be evaluated by comparing reinfection incidence rates in people of villages in the Madziwa project area with those in the witness villages in the Bushu area. In principle, improved hygiene and health education should limit the risk of reinfection. This would reduce the need for frequent chemotherapy with consequent savings in the costs of drug procurement and delivery. Nevertheless, the contribution of improved sanitation, safe water supplies and health education in controlling schistosomiasis is difficult to evaluate. Piped water may only influence a small proportion of human water contact activities which are normally carried out at natural bodies of water.[10] The construction of washing facilities at water points is an attraction away from natural water. However, streams may continue to be used for swimming and bathing.

Overall, snail infection rates declined somewhat during the course of the project implementation. However, there was marked spatial heterogeneity in snail infection rates among different sites. Under such circumstances, it is difficult to attribute the decline in snail infection rates partly or wholly to the latrine building program. In any case, some water contact activities may result in the contamination of natural water with schistosome eggs.[10] On the other hand improved sanitation would have a psychological effect, reinforcing health education messages and thereby encouraging behaviour patterns that result in less contamination.

There is concern that overall evaluation of the impact of the interventions will be difficult due to differences in location of villages in relation to natural bodies of water. Furthermore, account should be taken of variations in the number of latrines, water points and coverage of health education among the different villages. Also, the results of the epidemiological monitoring may be confused by movements of people among the villages. This calls for intensified monitoring in the second phase of the project so that adequate comparison can be made of the impact of the interventions among the various villages.

References

1. Taylor, P., Makura, O. Prevalence and distribution of schistosomiasis in Zimbabwe. Ann Trop Med Parasit 1985; 79: 287-99.

2. Chandiwana, S.K., Chirstensen, N. Analysis of the dynamics of transmission of human schistosomiasis in the highveld region of Zimbabwe. A review. Trop Med Parasit 1988; 39: 187-268.

3. Woolhouse, M.E.J., Chandiwana, S.K. The epidemiology of schistosome infections of snails: taking the theory into the field. Parasitology Today, 1990. (in press).

4. Ndamba, J. Schistosomiasis: its effects on the physical performance of school children in Zimbabwe. C Afr J Med 1986; 32: 289-93.

5. Munjoma, M. Ultrasonography for the detection of mobidity in schistosomiasis. Unpublished data. 1989.

6. Taylor, P. A proposed evaluation of a primary health care approach to control schistosomiasis in Zimbabwe. Trop Med Parasit 1986; 37: 160-63.

7. Taylor, P., Chandiwana, S.K., Matanhire, D. Evaluation of the reagent strip test for haematuria in the control of *Schistosoma haematobium* infection in school children. *Acta Tropica*. 1989; in press.

8. Shiff, C.J., Coutts, W.C.C., Yiannakis, C., Holmes, R.W. Seasonal patterns in the transmission of *Schistosoma haematobium* in Rhodesia, and its control by winter application of molluscicide. Trans Roy Soc Trop Med Hyg 1979; 73: 375-80.

9. Ndamba, J., Chandiwana, S.K., Makaza, N. The use of *Phytolacca dodecandra* berries in the control of trematode transmitting snails in Zimbabwe. *Acta Tropica* 1989; 46: 303-9.

10. Chandiwana, S.K. Community water contact patterns and the transmission of *Schistosoma haematobium* in the highveld region of Zimbabwe. Soc Sci Med 1987; 25: 495-505.

SUMMARY

COMMUNITY CONTROL OF SCHISTOSOMIASIS IN ZIMBABWE

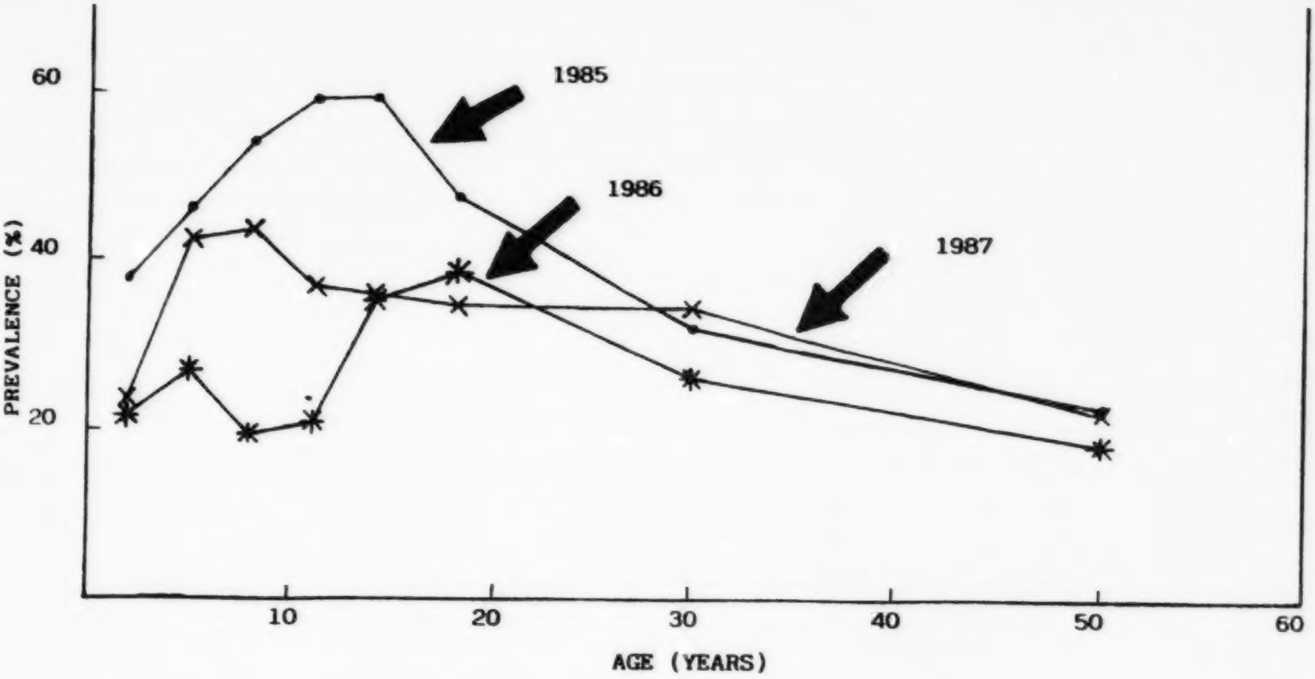
The community-based primary health care approach to control schistosomiasis morbidity is the strategy adopted in Zimbabwe. The paper outlines the results of such a control strategy in a rural community with over 30 000 people in the Madziwa area of Zimbabwe from 1985 to 1989. The community-based control strategy involved diagnosis of infection in school children (7-15 years of age) using reagent strips followed by treatment with praziquantel. The treatment was linked to programs aimed at improved sanitation, better water supplies and health education. Following chemotherapy, there was a marked reduction in schistosomiasis prevalence (from 60 to 20%) urinary and intestinal forms combined in the affected groups. Of even greater importance was the significant reduction of 90% in heavy infections (> 50 S. haematobium eggs per 10 ml of urine or > 100 S. mansoni eggs per gram of faeces). Progress made through chemotherapy was consolidated by the implementation of intervention measures aimed at reducing human water contact with cercariae infested water. In the last 3 years of the community-based program, 2 152 improved ventilated pit latrines were constructed and 104 hand pumps installed at new or existing water points. Drama competitions at schools showed great potential in communicating health education messages. However, technical and organizational difficulties limited the impact of the health education to the general population. A single application of the synthetic molluscicide Bayluscide was carried out in the main streams at the beginning of the program in support of the initial chemotherapy. There were logistical problems in evaluating the precise impact of the control program because of variations among the villages, their physical location in relation to snail habitats, differences in number of latrines and water points constructed and the extent of health education coverage. Nevertheless, the experience obtained in the Madziwa project demonstrates the feasibility of a community-based approach to control of schistosomiasis. Of significance is the fact that the strategy allows for the development of a consistent community-level surveillance system to monitor progress of the different interventions.

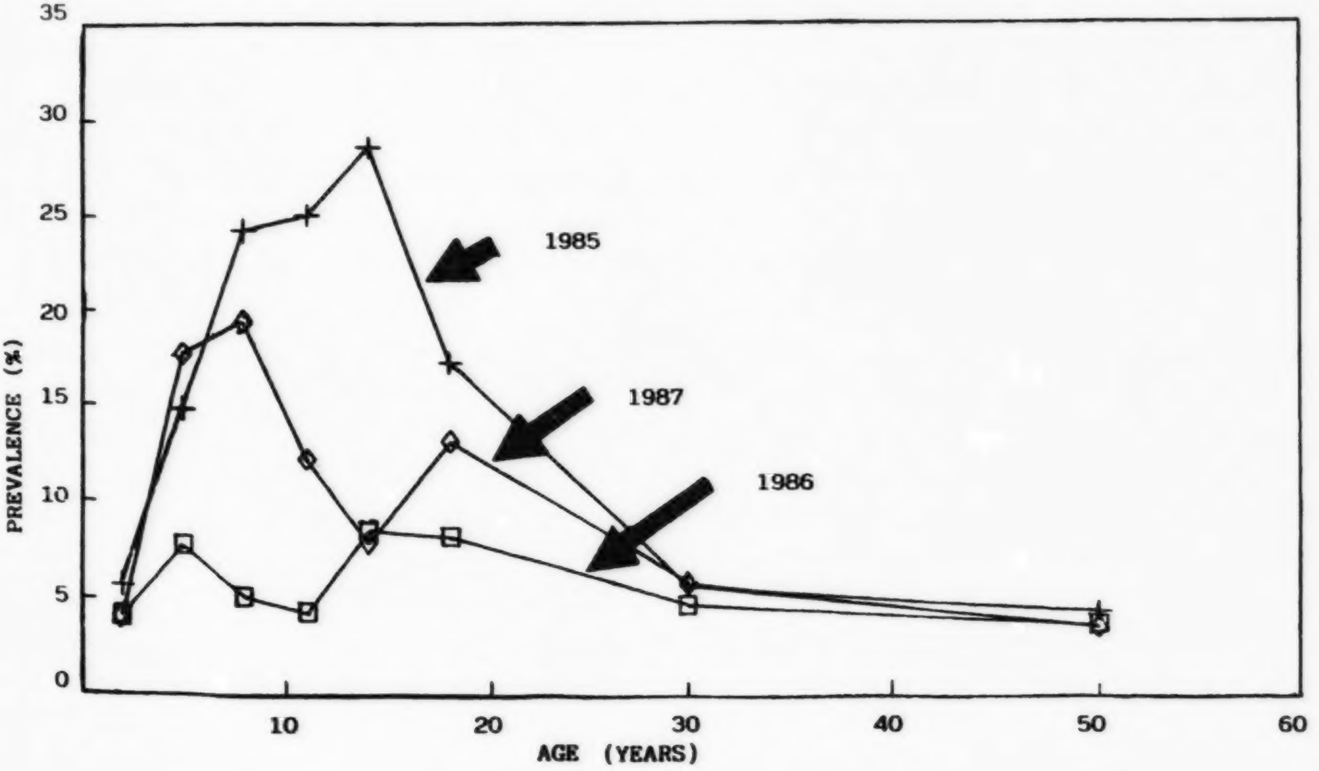
FIGURE LEGENDS

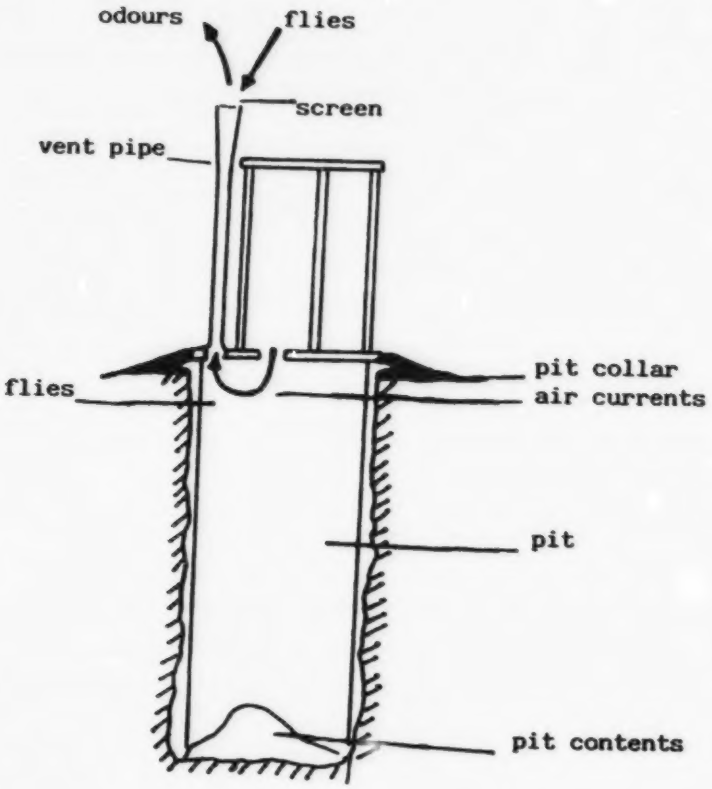
Fig. 1 Age group targeted treatment of *Schistosoma haematobium* in school children (7-15 years of age) living in Madziwa project area. Graphs in (a) show overall age prevalence profiles and in (b) prevalence of heavy infections (> 50 eggs per 10 ml of urine) for Jan/Feb 1986 (pretreatment) Sept/Oct 1986 (6 months after the second treatment).

Fig. 2 Cross-section of the Blair ventilated improved pit latrine. The main feature of thelatrine is the ventilation pipe which acts as a chimney and draws smell out through the pipe. A fly-screen made of stainless steel mesh keeps flies out of the pit as well as trapping those that attempt to fly out via the ventilation pipe.

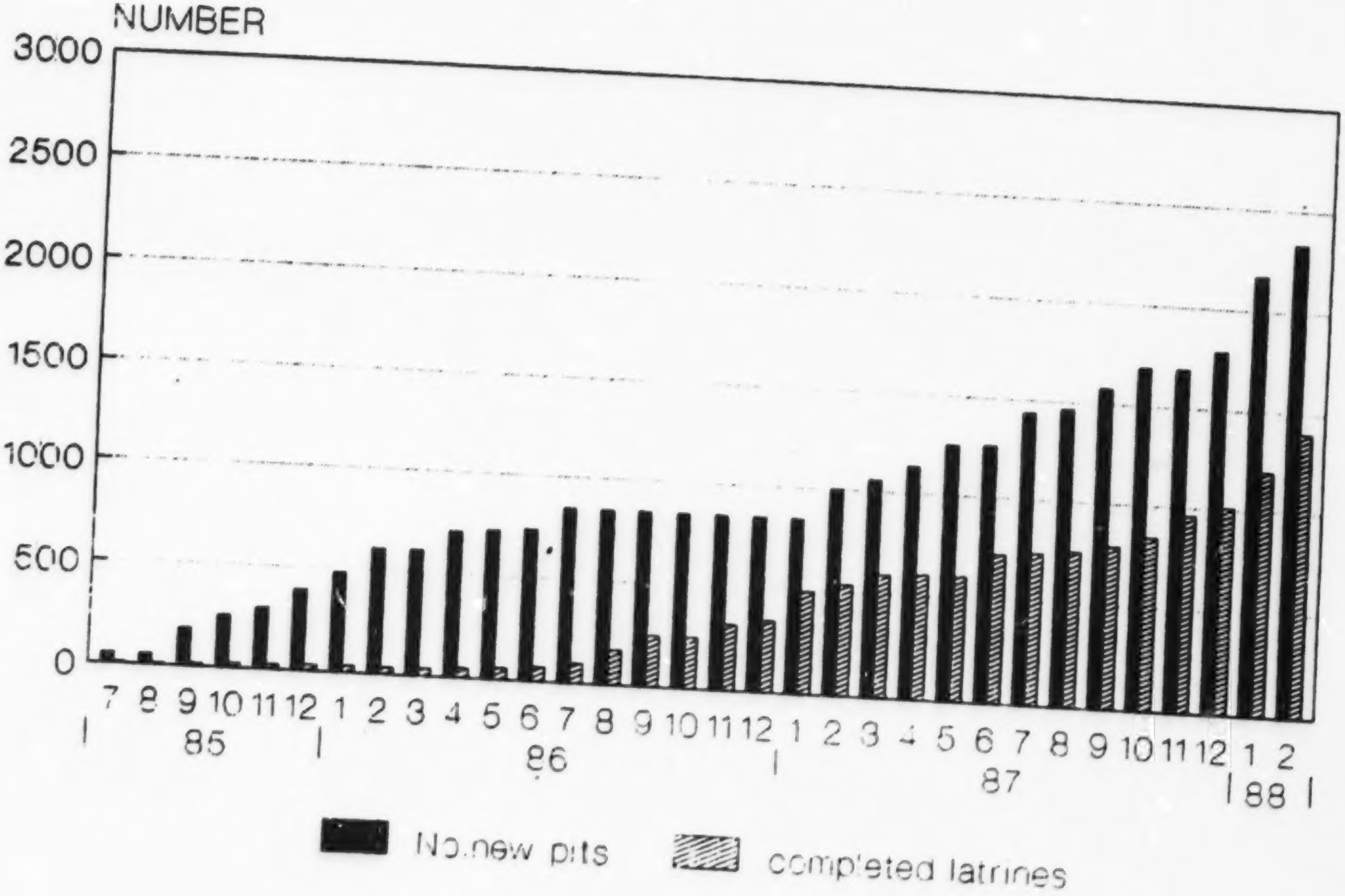
Fig. 3 Cumulative numbers of Blair latrines and pits from July 1985 to January 1989 in the Madziwa project area.


1985
1986
1987
60
40
20
PREVALENCE (%)
10
20
30
40
50
60
AGE (YEARS)


1985
1987
1986
35
30
25
20
15
10
5
0
PREVALENCE (%)
10
20
30
40
50
60
AGE (YEARS)


odours
flies
screen
vent pipe
pit collar
flies
air currents
pit
pit contents

SANITATION PROGRESS
MADZIWA



RECOMMENDATIONS OF THE SEMINAR

1. The Participants recognized that there was a growing need to continue holding such seminars with clear-cut objectives, with strong regional collaboration and international participation.

2. For improving the research on zoonoses and parasitic diseases in the region, there is an urgent need to conduct workshops focusing on development of relevant research proposals with emphasis on multidisciplinary community-based research.

3. Because the flow of scientific information between the countries in the region is often poor, it was strongly recommended that an information dissemination facility network be established to meet this need.

4. To seek avenues of further implementing the main recommendation that emerged from the second Pan-Arab Seminar, the establishment of a Pan-Arab Reference and Research Center for Zoonoses, in Amman, Jordan is recommended, to be affiliated to the Higher Council for Science and Technology.

PARTICIPANTS

Dr. Panduka Wijeyaratne (Ph.D.)
Senior Programs Officer
Tropical and Infectious Diseases
Health Science Division
IDRC
Ottawa, Canada

Dr. Yvone Abdel Shaheed (Ph.D.)
Cairo, Egypt

Dr. Mohamed Amer (M.D.)
Professor and Head,
Department of Dermatology and Venereology
Zagazig University
Cairo, Egypt

Dr. Mohammed El-Deek (Ph.D.)
Consultant (Chemist)
Regional Office
ROSTAS-UNESCO
Cairo, Egypt

Professor Rifky Faris (M.D.)
Chairman, Department of
Community, Environmental and Occupational Medicine
Faculty of Medicine
Ain Shams University
Cairo, Egypt

Dr. Magda Youssef (Ph.D.)
Professor and Head of
Department of Parasitology
Faculty of Medicine
Alexandria University
Alexandria, Egypt

Dr. Hoda Farag (Ph.D.)
Professor, Department of Parasitology
Medical Research Institute
Alexandria University
Alexandria, Egypt

Dr. G. Papdopoulos (Ph.D.)
Director of Mediterranean Zoonoses Control Centre
WHO
Athens, Greece

Thomas P. Navin (M.D.)
Medical Entomology Research and Training Unit
Guatemala City, Guatemala

Dr. Sabah N. Al-Abbasi (Ph.D.)
Assistant Professor/Department of Parasitology
College of Veterinary Medicine
University of Baghdad
Baghdad, Iraq

Nasreen Khairy Abdul-Rahman (M.S.)
Lecturer, Department of
Clinical Laboratory Sciences
College of Pharmacy
University of Baghdad
Baghdad, Iraq

Dr. Battol H. Al-Adhamy (Ph.D.)
Assistant Professor, Department of Microbiology
Al-Mustansiriyah College of Medicine
Baghdad, Iraq

Dr. Walid K. El-Hashimi (Ph.D.)
Assistant Professor, Department of Microbiology
Al-Mustansiriyah College of Medicine
Baghdad, Iraq

Dr. Farouk Hassan (Ph.D.)
Professor, Department of Microbiology
College of Veterinary Medicine
University of Baghdad
Baghdad, Iraq

Ms. Suad Zaki Jawdat (M.S.)
Senior Researcher, Biological Research Centre
Department of Microbiology
Scientific Research Council
Baghdad, Iraq

Dr. Tarik I. Al-Jebouri (Ph.D.)
Professor, Department of Microbiology
College of Medicine
University of Baghdad
Baghdad, Iraq

Dr. Azwar N. Khalaf
Director General, Biological Research Centre
Scientific Research Council
Baghdad, Iraq

Dr. Abdel-Hadi Khalili (FRCS)
Professor of Surgery
Department of Surgery
College of Medicine
University of Baghdad
Baghdad, Iraq

Dr. Baha'a M.A. Latif (Ph.D.)
Professor/Department of Parasitology
College of Veterinary Medicine
University of Baghdad
Baghdad, Iraq

Dr. Amjed D. Niazi (M.D., Ph.D.)
Director/Institute of Endemic Diseases
Ministry of Health
Baghdad, Iraq

Dr. Maysoun Rassan (Ph.D.)
Assistant Professor/Department of Clinical Chemistry
Saddam Medical College
Baghdad, Iraq

Dr. Naim Abdel Aziz (Ph.D.)
Consultant/Epidemiology Section
Ministry of Agriculture
Amman, Jordan

Dr. Omar Bataineh (M.D.)
Consultant, Dermatologist and Venereologist
King Hussein Medical Centre
Amman, Jordan

Dr. Layla Batarseh (Ph.D.)
Toxicologist
Researcher, Water Research and Study Centre
University of Jordan
Amman, Jordan

Dr. Yahia Dajani (M.D., FRC. Path)
Consultant Pathologist
Head of Consulting Medical Laboratories
Editor of IAP-Arab Division
Newsletter and Bulletin of Consulting Medical Laboratories
Amman, Jordan

Dr. Abdullah Al-Daoud (M.D.)
Dermatologist and Venereologist
Department of Dermatology and Venereology
King Hussein Medical Centre
Amman, Jordan

Dr. Youssef Dammen (M.D.)
Consultant and Chairman
Department of Dermatology and Venereology
Al-Basheir Hospital
Amman, Jordan

Dr. Mohammed Jamal (M.D., Ph.D.)
Consultant Dermatologist and Venereologist
Faculty of Medicine
University of Jordan
Amman, Jordan

Dr. Wajdi Kanaan (M.D., FRCP Ph.D.)
Consultant, Dermatologist and Venereologist
Amman, Jordan

Dr. Youssef Fandi Imeish (B.A.)
Virologist
Central Laboratories
Ministry of Health and Social Development
Amman, Jordan

Dr. Mohamed Al-Khateeb (Ph.D.)
Professor and Chairman
Department of Microbiology
Faculty of Medicine
University of Jordan
Amman, Jordan

Dr. Louie Khalefa (M.D.)
Consultant Dermatologist and Venereologist
Department of Dermatology and Venereology
Kings Hussein Medical Centre
Amman, Jordan

Dr. Waleed Al-Khateeb (Ph.D.)
Professor, Health and Environmental Sector
The Higher Council for Science and Technology
Amman, Jordan

Dr. Sami Khouri (M.D.)
Professor, Department of Community Medicine
Faculty of Medicine
University of Jordan
Amman, Jordan

Dr. Oumeish Youssef Oumeish (M.D., FAAD, FACP)
Consultant, Dermatologist and Venereologist
Chairman, Health Committee of the Higher Council for Science and Technology
President, The Jordanian Dematological and Venereological Society
Amman, Jordan

Dr. Mamdouh Qutob (M.D.)
Consultant Dermatologist and Venereologist
President, Pan-Arab League of Dermatologists
Amman, Jordan

Dr. Fathy Saleh (M.D., M.Sc.)
Chairman, Public Health Department
Amman Directorate of Health
Ministry of Health and Social Development
Amman, Jordan

Professor Elias Saliba (Ph.D.)
Associate Dean, Faculty of Graduate Studies
Professor of Parasitology
Department of Biological Sciences
University of Jordan
Amman, Jordan

Dr. Fouad Sayegh (M.D.)
Professor of Ophthalmology
Faculty of Medicine
University of Jordan
Amman, Jordan

Dr. Mohammed Sharaf (M.D.)
Associate Professor/Chairman of Department of Dermatology and Venereology
Faculty of Medicine
University of Jordan
Amman, Jordan

Dr. Ziad Sharaiha (FRCP)
Consultant Gastroenterologist
Amman, Jordan

Professor Assem Shihabi (Ph.D.)
Professor of Microbiology
Faculty of Medicine
University of Jordan
Amman, Jordan

Dr. Muhammed Rida Tawfiq (M.D.)
Chairman, Division of Malaria, Schistosomiasis and Leishmaniasis
Ministry of Health and Social Development
Amman, Jordan

Dr. Abdulla Toukan (Ph.D.)
Secretary General/The Higher Council for Science and Technology
Amman, Jordan

Dr. Nuha Nuwayri Salti (Ph.D.)
Associate Professor
Department of Human Morphology
Faculty of Medicine
A.U.B. Medical Centre
Beirut, Lebanon

Dr. Hisham Ardah (M.D.)
Consultant, Dermatologist and Venereologist
Nablus, Palestine

Dr. Adnan Kamal (M.D.)
Consultant, Dermatologist and Venereologist
Palestine

Dr. Khaled H. Al-Bayyari (M.D.)
Dermatologist and Venereologist
Doha, Qatar

Dr. M. Afak Siddiqui (M.D.)
Consultant
Department of Dermatology
Medical School
King Sauod University
Riyadh, Saudi Arabia

Dr. Marwan M. Khawajah (M.D.)
Associate Professor and Chairman Dermatology Department
Medical School
King Sauod University
Riyadh, Saudi Arabia

Dr. Reem Baiasi (M.D.)
The Syrian Arab Society of Dermatology
Damascus, Syria

Dr. Abdul-Kareem Chehade (M.D.)
Professor, Dermatologist and Venereologist
Faculty of Medicine
Aleppo University
Aleppo, Syria

Dr. Oussama El-Haj Hussein, (M.D.)
Consultant, Dermatologist and Venereologist
Secretary General, The Syrian Arab Society of Dermatology
Damascus, Syria

Dr. Mamoon Jallad (M.D.)
Professor, Dermatology and Venereology
Faculty of Medicine
Damascus University
President, The Syrian Arab Society of Dermatology
Damascus, Syria

Dr. Taher El-Jundi (M.D.)
Consultant and Chairman of Dermatology Department
Hameesh Hospital
Damascus, Syria

Dr. Aida Al-Kheiami (Ph.D.)
Associate Professor
Department of Parasitology and Mycology
Damascus University
Damascus, Syria

Dr. Ziad El-Khouly (M.D.)
Consultant, Dermatologist and Venereologist
The Syrian Arab Society of Dermatology
Damascus, Syria

Dr. Abdullah Mouakeh (M.D.)
Associate Professor of Dermatology and Venereology
Medical School
Aleppo University
Aleppo, Syria

Dr. Noury Modarris (M.D.)
Consultant Radiologist
Medical School
Damascus University
Damascus, Syria

Dr. K. de Balogh (Ph.D.)
Associate Professor, Veterinary Public Health Unit
WHO
Geneva, Switzerland

Dr. M.S. Ben-Rachid (Ph.D.)
Professor, Department of Parasitology
Faculty of Medicine
Tunis, Tunisia

Dr. Riadh Ben-Ismail (Ph.D.)
Professor, Department of Parasitology
Faculty of Medicine
Tunis, Tunisia

Dr. Adel A.M. Aulaqi (M.D., FRCS)
Medical Advisor, Welcome Foundation Research Fellow and Clinical Assistant
Hammersmith Hospital
London, United Kingdom

Miss Shaden Kamhawi (M.Sc.)
Researcher, Department of Biological Sciences
Salford University
Salford, United Kingdom

Dr. D.C.W. Mobey (M.D., MRCP)
Senior Lecturer and Consultant Physician
Department of Clinical Sciences
London School of Hygiene and Tropical Medicine
University of London
London, United Kingdom

Dr. Lawrence C. Parish (M.D., FACP)
Clinical Professor of Dermatology and Director of the Jefferson Centre for International Dermatology
Jefferson Medical College
Thomas Jefferson University
Philadelphia, PA, U.S.A.

Dr. Vernon G. Tipton (Ph.D.)
Director, Centre for Educational and Cultural Affairs
Professor of Zoology
Brigham Young University
Utah, U.S.A.

Dr. Bryce C. Walton (Ph.D.)
Parasitologist
Gettysburg, PA, U.S.A.

Mr. Gene R. Hedin
President, RDM, International
Phoenix, AZ, U.S.A.

Dr. Stephen Chandiwanna (Ph.D.)
Blair Research Laboratory
Ministry of Health
Harare, Zimbabwe